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# THESIS

**HIGH-TECH, LOW-TECH, NO-TECH: COMMUNICATIONS STRATEGIES DURING BLACKOUTS**

by

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December 2013

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How do emergency managers communicate vital life-safety information when disaster strikes and the power goes out, sometimes for extended periods? Time and again, our power grid, aging and stretched beyond its intended capacity, has experienced failures. Power outages can quickly shift from being annoying to deadly—especially when temperatures are extreme—particularly for elderly and other vulnerable populations.

Emergency managers will be able to use the findings of this research to communicate critical information to the community, even in the direst circumstances, without relying on a "techno-fix." A structured focused comparison of three disasters revealed that a "high-tech, low-tech, no-tech" framework can be implemented successfully and inexpensively. Throughout the three disasters studied, communications methods in the high-tech, low-tech, and no-tech areas were successful in communicating with the public.

The thesis recommends that every community be prepared with this three-pronged approach. To go a step further, the study recommends that FEMA consider incorporating the "high-low-no-tech" approach into its COOP (Continuity of Operations Plan) template, which currently assumes that communications systems—phones, Internet, email, two-way radios—will be operational within 12 hours of activation, an optimistic assumption. A sample implementation plan with cost estimates is included.

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# HIGH-TECH, LOW-TECH, NO-TECH: COMMUNICATIONS STRATEGIES DURING BLACKOUTS

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# ABSTRACT

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The thesis recommends that every community be prepared with this three-pronged approach. To go a step further, the study recommends that FEMA consider incorporating the "high-low-no-tech" approach into its COOP (Continuity of Operations Plan) template, which currently assumes that communications systems—phones, Internet, email, two-way radios—will be operational within 12 hours of activation, an optimistic assumption. A sample implementation plan with cost estimates is included.

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| 911 | System established in the United States for emergency communications |
| ACORN | Association of Community Organizations for Reform Now |
| AM/FM | Amplitude Modulation / Frequency Modulation (radio broadcasting) |
| CDC | Centers for Disease Control |
| CERT | Community Emergency Response Team |
| CIA | Central Intelligence Agency |
| COOP | Continuity of Operations Plan |
| COW | Cell on Wheels |
| DHS | Department of Homeland Security |
| ECC | Emergency Communications Center |
| EOC | Emergency Operations Center |
| FBI | Federal Bureau of Investigation |
| FCC | Federal Communications Commission |
| FEMA | Federal Emergency Management Agency |
| GEJE | Great East Japan Earthquake |
| ICS | Incident Command System |
| IM | Instant Message or Instant Messaging |
| JMA | Japan Meteorological Agency |
| NASA | National Aeronautics and Space Administration |
| NCR | National Capital Region |
| NOAA | National Oceanic and Atmospheric Administration |
| NWS | National Weather Service |
| PIO | Public Information Officer |
| PSA | Public Service Announcement |
| WEA | Wireless Emergency Alerts |

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# EXECUTIVE SUMMARY

*"All systems, all vestiges of modern living — communications, power, water — all are down. There is no way to communicate with the people."*

Philippine Interior Secretary Mar Roxas,
following Typhoon Haiyan, 2013

Communicating important information to the public during disasters is a core objective for emergency managers. But how can emergency managers communicate with their community when plugged-in forms of communication are not available to a large number of people?

Power outages frequently occur, and often accompany major crises, particularly natural disasters such as severe weather events. Thus, during crises, communications are often severely hampered—just when emergency managers have the greatest need to communicate with the community.

Despite the preponderance of power outages, coupled with this important communications need, a review of the literature revealed few existing recommendations on what tactics could help emergency managers communicate with the public when the lights go out. In fact, a number of reports concluded that "something else" would be needed when the power goes out, but few, if any, went on to suggest what that "something" might be.

This project filled the gap by researching what specific solutions have successfully been used to communicate critical information to the public during emergencies involving major blackouts. This research project reviewed and analyzed three crises that involved major blackouts and subsequent communications problems:

- **Multi-state blackout**, northeast U.S., 2003
- **Hurricane Katrina**, Gulf Coast, U.S., 2005
- **Triple disaster** (earthquake, tsunami, nuclear), Japan, 2011

The research project led to the discovery of a three-tiered framework, consisting of “high-tech, low-tech, and no-tech” communications strategies.

Emergency managers can leverage the high usage of mobile devices and exploit it for emergency communications purposes. Assuming emergency managers have access to backup generators, they can send out messages via social media channels. governments in the disaster-affected areas of Japan’s triple disaster now consider social networks to be a valuable communications tool in disasters.

It was clear across the three cases that, whatever the situation, what people needed most was extremely localized information. Across the cases, hyper-local community radio stations were among the top sources of extremely local information that people needed most. In addition, as conditions improved, hyper-local radio transitioned to sources of support and comfort, thus serving as vital lifelines to connect communities.

When all else fails, local governments must be prepared to go backward and use old-fashioned methods to reach people with information. In all three cases, people used their ingenuity to figure out ways to get information out, including handwritten posters, old-school flyers, and bullhorns. The focus should be on getting information to the places where people naturally gather following disasters, e.g., corner stores, evacuation centers, gas stations.

This research study filled a noticeable gap in the literature and in the fields of emergency communications and management. This study will help emergency managers prepare for the next inevitable power outage as well as the direst circumstances.

None of these methods is revolutionary, so what is new here? What is new is the proposal that emergency managers in local jurisdictions proactively prepare for the worst scenarios, by making preparations for communicating with their public, via the “high-tech, low-tech, no-tech” combination. Key elements for success include:

- Focusing on the hyper-local information that people need.
- Flexibility to quickly adapt and use those tools and channels that are up and working.
- Nurturing and encouraging private efforts to help in response and relief efforts.
- Preparing for the worst.
- Not relying on a “techno-fix.”

Such preparations will give emergency managers the confidence to know that, no matter the severity of the incident, they will be able to provide essential information to their communities and improve safety, resilience, and survival rates.

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# I. HIGH-TECH, LOW-TECH, NO-TECH: COMMUNICATIONS STRATEGIES DURING BLACKOUTS

On July 29, 2012, a series of straight-line "*derecho*"[1] windstorms hit the mid-Atlantic region of the United States. In the National Capital Region (NCR), many residents lost electricity, more than one million in Virginia alone. Verizon, which manages all 911 services in the region, suffered loss of its backup generators at two critical centers, cutting off 911 services to 1.5 million residents.[2]

Many in the region lost telephone service, both landline and mobile. With the community's loss of telephone, Internet, and electric power, emergency managers lost the ability to share critical life/safety information with the community. This all occurred during record-setting high temperatures. Hundreds of thousands of residents were without power and air-conditioning, for multiple days. Elderly residents and those with limited mobility or health problems were not able to call for help, could not be directed to a cooling center, and could not receive critical life/safety information.

This crisis was not an anomaly.

## A. INTRODUCTION

Power outages are common occurrences that affect all communities. Major blackouts in the U.S. in recent years have resulted from a variety of causes, including massive flooding (Grand Forks, North Dakota, 1997), rolling blackouts (California, 2001), multi-state power outage (Ohio and seven other

1 "*Derecho*" is a series of severe, widespread, straight-line windstorms.

2 State Corporation Commission, *Staff Report of Final Findings and Recommendations, Case no. PUC-2012-00042, in the Matter of Investigating 911 Emergency Call Service Outages and Problems* (Richmond, Virginia: Commonwealth of Virginia, 2013), http://www.scc.virginia.gov/newsrel/c_911out_13.pdf.

U.S. states and two Canadian provinces, 2003), hurricanes (Louisiana and Mississippi, 2005), and severe storms (Superstorm Sandy, Atlantic coast, 2012; ice storm, New Hampshire, 2008).

Blackouts can also be created by causes other than weather; during the past two decades, non-disaster-related blackouts have increased 124 percent.[3]

Time and again, our power grid, aging and stretched beyond its intended capacity, has experienced failures. Power outages can quickly shift from being annoying to deadly—especially when temperatures are extreme—creating dangerous life/safety situations, particularly for elderly and other vulnerable or dependent populations.

The point is, crippling power outages can, and do, occur.

**When the power goes out:** During crises, people need information: about the crisis itself; where to obtain food or water; where to find shelter; how to find loved ones; how to receive help or help others; and how to prevent or treat crisis-related disease. Our society is dependent on electricity-powered information channels, and is at a loss when they are not working.

People receive information primarily from methods that require electric power in some form. This includes traditional media, such as television news, radio, and print media, as well as digital information sources, including via mobile devices, the use of which is spreading rapidly. Even newspapers require electricity to set type and run printing presses.

But what happens when these tools are not available? Key government facilities have generator backup and emergency managers can send information, but during major power outages, residents quickly lose the ability to receive this valuable information.

3 Such blackouts have increased from 41 (1991–1995) to 92 (2001–2005). Source: Thom Patterson, "U.S. Electricity Blackouts Skyrocketing," CNN, http://edition.cnn.com/2010/TECH/innovation/08/09/smart.grid/index.html.

**Help for emergency managers needed:** Communicating important information to the public during disasters is a core objective for emergency managers. But how can emergency managers communicate with their target publics when plugged-in forms of communication are not available to a large number of people? This problem is viewed through the lens of a practitioner with nearly thirty years of experience working in public relations and crisis communications, with more than ten years working in local emergency management.

## B. STATEMENT OF THE PROBLEM

During large-scale, sustained power failures, the problem is that the ability of emergency managers to communicate important life/safety information to the public is greatly hindered. To begin to identify potential solutions to this important problem, it was useful to identify three key problem areas related to public communications during severe power outages. Two of these areas, numbers 1 and 3, are related to the physical technology or infrastructure; area number 2 reflects a broader need during emergencies.

**Area Number 1: Fragile Communication Channels.** During emergency responses that include major power outages, emergency managers frequently find many communication channels on which they normally rely are not usable. For example, television stations may be airing news coverage, but households without power cannot view the broadcast. Emergency managers can post useful information on the locality's website or send it by email, but households without power do not have access to the Internet.

**Area Number 2: Mismatched Information.** In times of crisis, people have a need for hyper-local information. Mainstream media is often focused on larger, more sensational aspects of the overall crisis, at a time when individuals need specifics on where to get local help for critical items such as water, food, shelter or medication.

**Area Number 3: Infrastructure Collapse.** When infrastructure has been destroyed and normal communication methods are disabled, emergency managers will struggle to communicate vital information with the public. For example, a city's Town Hall and Emergency Operations Center may have backup generator power, but what if Town Hall and the entire downtown area have been washed away by a severe storm or leveled by terrorists?

During severe power outages, emergency managers face these three core issues as they work to fulfill a core mission objective: sharing critical information with the public.

## C. BACKGROUND AND NEED

Power outages frequently occur, and often accompany major crises, particularly natural disasters such as severe weather events. Thus, during crises, communications are often severely hampered—just when emergency managers have the greatest need to communicate with the community.

Despite the preponderance of power outages, coupled with this important communications need, a review of the literature revealed few existing plans or recommendations on what tactics could help emergency managers communicate with the public when the lights go out.[4] During a U.S. House of Representatives hearing on the response to Hurricane Katrina, Representative Tammy Baldwin (D-WI) asked, "It sounds like it can happen again. How many local governments have a communications plan when everything fails?"[5]

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4 Examples include: Kentucky Public Service Commission, *Ike and Ice: Report on the September 2008 Wind Storm and the January 2009 Ice Storm* (Lexington, Kentucky: State of Kentucky [2009]), http://psc.ky.gov/IkeIce/Report.pdf, Cabinet Office, "Resilient Communications," Government of the United Kingdom, https://www.gov.uk/resilient-communications.

5 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina* (Washington, D.C.: U.S. Government Printing Office [2006]). http://www.gpoacess.gov/congress/index.html.

While it is difficult to find articulated plans, the literature reveals instances in which emergency managers have successfully addressed the three key areas of concern.

**Area Number 1: Fragile Communication Channels.** Some communities have had success using newer technologies, such as emergency text alerting, which can be transmitted more easily than a mobile phone call, and social media channels. People have found ways to recharge mobile devices, including using their cars, or facilities with backup generators.

**Area Number 2: Mismatched Information.** Local radio has proven an effective means of getting hyper-local information to the community. For example, local radio was called the "most effective tool" in the aftermath of the 2010 Haiti earthquake, to provide valuable information to the victims of the disaster.[6]

**Area Number 3: Infrastructure Collapse.** When all else fails, emergency managers have found ways to use old-school methods to get information to those who need it. For example, when a massive flood wiped out Grand Forks, North Dakota in 1997, emergency managers printed old-fashioned newsletters to share important information with thousands of people living in FEMA trailers.[7]

6 Knight Foundation, "Lessons from Haiti: Media, Information System and Communities," John S. and James L. Knight Foundation, http://www.knightfoundation.org/publications/media-information-system-and-communities-lessons-h.

7 City of Grand Forks, *Grand Forks Flood Disaster and Recovery Lessons Learned,* City of Grand Forks, North Dakota, (2011), http://www.grandforksgov.com/Reports/lessonslearned.pdf.

The literature includes many reports that acknowledged the many communications problems that communities face during major power outages.[8] In fact, a number of reports concluded that "something else" would be needed when the power goes out, but few, if any, went on to suggest what that "something" might be.

This project filled the gap by identifying what specific solutions have successfully been used to communicate critical information to the public during emergencies involving major blackouts.

## D. PURPOSE OF THE STUDY

The purpose of this study was to look for ways that communities have successfully addressed the three core issue areas, in order to help local emergency managers improve their ability to communicate important information with the public during severe power outages. The project focused on blackouts that go far beyond the routine inconvenience of a two-hour power outage; severe blackouts are of a sufficiently large scope to impact people's health and survival.

Effective public communication is a core goal of emergency management; yet normal methods used to achieve these results are frequently hampered or rendered unusable by major power outages. To prepare for such incidents, emergency managers need contingency plans in order to be able to convey urgent information to their target publics.

Since U.S. communities have a lot of experience managing through blackouts, this researcher began this project assuming that it would be easy to find emergency operations plans and reports that address this problem. As a review of literature revealed a dearth of such plans, the effort then turned to looking for successful implementation of solutions to address the three core

8 Examples include Lois Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake* (London, England: Internews Europe [2013]), http://www.internews.eu/docs/Publications/InternewsEurope_Report_Japan_Connecting_the_last_mile_Japan_2013.pdf.; James Garnett and Alexander Kouzmin, "Communicating Throughout Katrina: Competing and Complementary Conceptual Lenses on Crisis Communication," *Public Administration Review* 67, no. S1 (December, 2007), 171–188. http://bit.ly/VU2prb.

issues, in order to help emergency managers better plan for the inevitable power outage.

This research project reviewed and analyzed three crises that involved major blackouts and subsequent communications problems. The cases are of different geographies, different scope, and different causes. All are relatively recent, as the wired nature of our modern society is a basic aspect of our modern world. All were catastrophic in nature, with significant loss of basic infrastructure, affecting millions of people and causing a total disruption of the community. And all have been written about widely. The three cases:

- **Multi-state blackout**, northeast U.S., 2003—chosen to study a non-weather-related disaster that affected a wide swath of two nations and millions of victims.
- **Hurricane Katrina**, Gulf Coast, U.S., 2005—chosen to study an example of a catastrophic disaster that devastated the infrastructure of a community.
- **Triple disaster** (earthquake, tsunami, nuclear), Japan, 2011—chosen to study how another country managed through a devastating disaster. Japan and the U.S. have many similarities; both nations have a democratic government, a strong federal government, and are highly developed and technologically savvy.

These three cases were chosen to provide diversity; they were diverse in terms of causation, geography, and scope. All three cases also had a number of similarities: all had significant communications breakdowns and difficulties getting critical information to people who needed it. All three incidents were catastrophic in nature, resulting in total disruption of the community. The research project examined these cases to look for successful examples of public emergency communications to help inform emergency managers who face similar issues in the future.

### 1. "High-Low-No-Tech" Framework

The review of the literature (Chapter II) led to the discovery of a three-tiered framework to address the three key areas of concern for public communications. This conceptual framework consists of "high-tech, low-tech, and no-tech"[9] communications strategies:

- **High-tech** methods were primarily those that reach mobile devices, the use of which is expanding rapidly in the U.S. These methods included using social media channels, which are very powerful ways to reach our increasingly wired society. These methods help address problem Area Number 1, fragile communications channels.
- **Low-tech** methods included local community radio, which provide hyper-local information. People could receive broadcasts on radios powered by batteries, hand cranking, solar, or car batteries. These methods help address problem Area Number 2, Mismatched information.
- **No-tech** options were used when all else failed and emergency managers were forced to return to old-school methods. For example, after Hurricane Katrina, firefighters distributed flyers throughout the Gulf Coast. Japanese newspaper reporters posted handwritten posters on public walls. When a massive 1997 flood wiped out Grand Forks, North Dakota, the town used old-fashioned newsletters to communicate with thousands of people living in FEMA trailers.[10] These methods help address problem Area Number 3, infrastructure collapse.

## E. RESEARCH QUESTION

*What high-tech, low-tech, and no-tech communication strategies can support public communications during large-scale power outages?*

9 With gratitude to CHDS alumna Tammy Spicer (cohort 1105/1106) for her suggestion of the phrase "high-tech, low-tech, no-tech."

10 City of Grand Forks, *Grand Forks Flood Disaster and Recovery Lessons Learned*, City of Grand Forks, North Dakota, (2011), http://www.grandforksgov.com/Reports/lessonslearned.pdf.

In order to answer this overarching question, the project included a number of supporting research questions to collect the data and analyze it within the conceptual framework; the entire list is located in Chapter III and is discussed in further detail in Appendix B.

## F. SIGNIFICANCE TO THE FIELD

This research study filled a noticeable gap in the literature and in the fields of emergency communications and management. This study will help emergency managers prepare for the next inevitable power outage as well as the direst circumstances. Such preparations will give emergency managers the confidence to know that, no matter the severity of the incident, they will be able to provide essential information to their communities and improve safety, resilience, and survival rates.

Future research will be able to advance this topic even further, drawing on new incidents, and looking at new technologies.

## G. UPCOMING CHAPTERS

This chapter explained the goal, scope, and need of the thesis project, how it filled a gap in existing research, and how it used the “high-tech, low-tech, no-tech” conceptual framework to examine and analyze the data.

Chapter II will review available literature that addresses the conceptual framework, and looks at three core communications issues that emergency managers face during major blackouts. This is followed by studies of three major crises involving emergency communications that were hampered by major power failures. The project uses the conceptual framework to provide an analysis and discussion of solutions to address the three key emergency communications areas studied. The study concludes with recommendations for local emergency managers.

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# II. LITERATURE REVIEW

*One of the most important crisis management actions state government takes during an emergency is to provide information to the public.*[11]

## A. INTRODUCTION

Power outages are a common occurrence, including in the United States. While they can happen at any time, due to a variety of causes, power outages frequently accompany severe weather events, thus compounding the natural disaster. During major blackouts, just when people most need important life/safety information, emergency managers' ability to convey this information is gravely hindered.

The project began by searching for existing plans that address this need. Finding none, the research project turned to looking for data in existing literature.

The literature review was conducted by looking at three core issues related to the problem of how to communicate important information to the public during major power outages. The first section addressed fragile communications channels; the second section looked at Mismatched information during crises; and the third section examined the total collapse of infrastructure, including communications infrastructure.

11 Michigan Public Service Commission, Report on August 14th Blackout (Lansing, Michigan: State of Michigan [2003]), http://www.michigan.gov/documents/mpsc%5fblackout%5f77423%5f7.pdf.

## B. AREA 1: FRAGILE COMMUNICATION CHANNELS

Many published research reports on the topic of catastrophic power outages focused on the infrastructure; many discussed communications problems.[12] The few solutions offered are in the realm of high-tech channels, including social media.[13]

A report from a group of European Chief Risk Officers is typical of this approach. It acknowledged that power outages "challenge society" when major infrastructure is affected, including communications. The report focused on the risks and impacts to infrastructure, business, and the economy, but did not address public communications solutions.[14]

For example, the Risk Officers noted that many critical systems such as hospitals, sewage systems, and stock exchanges have generators; however, most are fueled for a maximum of a few days. Immediately after a blackout, it is not possible to purchase goods without cash, as electronic payments are not possible. Without electricity, gas station pumps do not work, leaving the public without fuel for cars and generators.[15] The report acknowledged that loss of the ability to communicate is a negative.

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12 Examples include Michael Bloomberg, A Stronger, More Resilient New York (New York, New York: City of New York [2013]), http://www.nyc.gov/html/sirr/html/report/report.shtml.; Michigan Public Service Commission, Report on August 14th Blackout; State of New Hampshire, December 11–12, 2008 Ice Storm: State Response After-Action Report (Concord, New Hampshire: New Hampshire Dept. of Safety, Homeland Security & Emergency Management [2009]), http://www.nh.gov/safety/divisions/hsem/documents/dec08_icestorm_after_action_report.pdf.

13 Examples include Rosabeth Moss Kanter, "Surprise! Four Strategies for Coping with Disruptions," Harvard Business Review, http://blogs.hbr.org/kanter/2010/04/surprise-four-strategies-for-c.html (accessed May 30, 2013); Kentucky Public Service Commission, *Ike and Ice: Report on the September 2008 Wind Storm and the January 2009 Ice Storm*, 166; Adrian Kun, "Twitter Became Primary Boulder Fire Information Source," *University of Colorado, CUindependent.Com*, September 8, 2010, http://www.cuindependent.com/2010/09/08/twitter-became-primary-boulder-fire-information-source/17444/.

14 Michael Bruch et al., *Power Blackout Risks: Risk Management Options* (The Netherlands: CRO Forum [2011]), http://www.agcs.allianz.com/assets/PDFs/Special%20and%20stand-alone%20articles/Power_Blackout_Risks.pdf.

15 Ibid.

Many papers have been written about the infrastructure of power outages (i.e., how the power grid works, vulnerabilities, and ways to strengthen the system). For example, in 2012, a U.S. Senate committee held hearings on "Weather-Related Electrical Outages" and what actions should be taken to help or moderate such outages. The witness panels were comprised of representatives from U.S. Department of Energy, Federal Energy Regulatory Commission, New Hampshire Public Utilities Commission, and Norwich Public Utilities. The focus of the hearing was on the power grid.[16]

In 2013, New York City produced a 445-page comprehensive plan, "A Stronger, More Resilient New York," to rebuild communities impacted by Super Storm Sandy, and to increase the city's resilience. Much of the report was focused on infrastructure. Though the report acknowledged that communications were severely hampered by the severe power outage, the focus was how to harden the infrastructure; the report did not address how the city might communicate to the public during these dire circumstances.[17]

**High-tech solutions suggested:** The communications field continues to evolve rapidly. Blogs and Twitter feeds are increasingly serving as primary sources of information. Rosabeth Moss Kantor of Harvard Business School recommended leveraging social networks to minimize disruptions, and to disseminate data in short cycles.[18]

Social media have proven to be reliable communications methods during emergencies. The University of Colorado's newspaper reported that Twitter was one of the better sources for up-to-date information on the 2010 Boulder fire.[19] Arlington County, Virginia County Manager Barbara Donnellan reported to the Arlington County Board that Twitter was one of the few channels that worked

16 U.S. Senate Committee on Energy & Natural Resources, Full Committee Hearing: Weather-Related Electrical Outages (Video) (Washington, D.C.: U.S. Senate [April 26, 2012]).

17 Bloomberg, "A Stronger, More Resilient New York."

18 Kanter, "Surprise! Four Strategies for Coping with Disruptions."

19 Kun, "Twitter Became Primary Boulder Fire Information Source."

flawlessly throughout the 2012 *"super-derecho"*[20] storm event.[21] During its 2012 typhoon, the government of the Philippines used Twitter to engage with residents, not only to provide information, but also to request help with situational awareness.[22]

In 2008-2009, the state of Kentucky received a one-two punch from "Ike" and "Ice," two severe weather incidents: September 2008 windstorm (Ike) and January 2009 ice storm (Ice). A report on Ike and Ice from the Kentucky Public Service Commission described how lack of phone service hindered the ability to get information to news media.[23] The report also noted that many residents do not understand that portable telephone handsets do not function when their batteries lose power.[24]

The Kentucky report included a round-up of all regional power companies on their use (or non-use) of their own websites to provide updated information to customers.[25] A standout in these events was Duke Kentucky, one of the affected utilities, and its public information efforts. The report complimented Duke Kentucky on its proactive use of Twitter to share frequent updates with the public. The report included a discussion of the utility's use of a popular hashtag for that storm, "#snOMG." It also mentioned that Madisonville (Kentucky) Mayor Bill Cox used Facebook to provide useful information to his constituents, including information on utility crew locations, boil water advisories, traffic conditions and

20 "*Derecho*" is a series of severe, widespread, straight-line windstorms.

21 Barbara Donnellan, *Derecho*: Recovering from Catastrophic Storms (Arlington, Virginia: Arlington County, Virginia [2012]), http://www.arlingtonva.us/departments/CountyManager/Documents/file86924.pdf.

22 Darrell M. West and Elizabeth Valentini, How Mobile Devices are Transforming Disaster Relief and Public Safety (Washington, DC: Brookings Institution [2013]).

23 Kentucky Public Service Commission, *Ike and Ice: Report on the September 2008 Wind Storm and the January 2009 Ice Storm*, 166.

24 Ibid.

25 Ibid.

emergency shelters. The report recommended that all utilities consider establishing their own social media accounts to share important information during crises.[26]

In July 2012, the American Red Cross established a new Digital Operations center within its National Disaster Operations Center. It was the first of its kind to monitor social media to aid disaster relief efforts, acknowledging the increasingly important role that social media plays in Americans' daily life.[27]

The response to the 2010 Haiti earthquake saw several innovations, including crowdsourced maps that helped in rescue and humanitarian efforts.[28] Within two hours of Haiti's devastating 2010 earthquake, students at Tufts University in Boston set up an Ushahidi website. Witnesses sent information by text message; volunteers mapped GPS coordinates and provided critical information to rescue teams on the ground. Some of the messages were simple: "I'm buried under rubble, but I'm still alive." In the 25 days following the earthquake, Ushahidi-Haiti mapped some 2,500 reports.[29] The Tufts example showed the value of virtual volunteers, who brought their expertise and capabilities, unhindered by unstable infrastructure in the disaster community.

A blogger for the Emergency Management website urged utilities and governments to use their websites for critical information during emergencies, and to make that information available for smartphones.[30]

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26 Ibid.

27 U.S. House Homeland Security Committee, House Homeland Security Emergency Preparedness, Response, and Communications Subcommittee Visits Red Cross Digital Ops Center; Center is First to use Social Media Monitoring for Disaster Relief (Lanham, Maryland: Federal Information & News Dispatch, Inc. [2012]), http://libproxy.nps.edu/login?url=http://search.proquest.com.libproxy.nps.edu/docview/1026925663?accountid=12702.

28 Knight Foundation, Lessons from Haiti: Media, Information System and Communities.

29 Jessica Ramirez, "'Ushahidi' Technology Saves Lives in Haiti and Chile," TIME Magazine, March 3, 2010.

30 Gerald Baron, "Power Outage Communications—Lessons Apply to Emergency Communications," Crisis Comm blog, Emergency Management website, http://www.emergencymgmt.com/emergency-blogs/crisis-comm/Power-outage-communications--lessons-apply-122111.html.

Many communities, including the researcher's own community of Arlington, Virginia, have developed emergency alert systems, which send text messages to subscribers via email accounts or mobile devices. The local jurisdictions comprising the National Capital Region collaborate on the CAPITALERT campaign, to encourage all residents, workers, and visitors to subscribe to alert systems.[31]

## C. AREA 2: MISMATCHED INFORMATION

The research showed that, during crises, people crave hyper-local information, at a time when broadcast media are focused on the larger crisis. In a number of cases, local community radio proved useful in this regard.

The Knight Foundation reported that radio was the "most effective tool" in the aftermath of the devastating 2010 Haiti earthquake, providing valuable information to the community and serving as a "heroic lifeline."[32] In contrast, the report on the 2008 New Hampshire ice storm described that some people relied on car radios, but many local radio stations did not have local staff to receive and air information, and instead, aired nationally syndicated programming.[33]

A bipartisan U.S. House of Representatives committee report on Hurricane Katrina included a 19-page section on communications infrastructure, which discussed satellite phones, radio communications, and other ways in which responders and operations centers can communicate with each other. The report contained only one mention of how residents could receive important information, when it described how evacuees in the Superdome listened to AM radio.[34]

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31 For example, people can sign up for Arlington Alert at www.arlingtonalert.com, and they can also sign up at the regional cooperative website www.capitalalert.gov.

32 Knight Foundation, Lessons from Haiti: Media, Information System and Communities.

33 State of New Hampshire, December 11–12, 2008, Ice Storm: State Response After-Action Report.

34 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

The 2009 Kentucky report described that utilities used their designated spokespeople to share information with local news media, and that local radio was particularly effective.[35]

## D. AREA 3: INFRASTRUCTURE COLLAPSE

In looking at the direst circumstances, the research turned up evidence of success in conveying information to the public, by using old-school methods.

In 1997, a massive flood virtually wiped out the town of Grand Forks, North Dakota. With most of its major infrastructure destroyed, and 90 percent of its population evacuated, Grand Forks realized that it was impossible for local government to over-communicate. Local government stood up a Public Information Center, which used old-fashioned newsletters to communicate with thousands of people living in FEMA trailers.[36]

For its 2012 *derecho* storm response, emergency managers in Arlington, Virginia created flyers with critical information on heat safety and asked its Community Emergency Response Teams (CERT) to distribute them to the most vulnerable residents.[37] Arlington coped with the loss of its 911 system by staffing every fire station 24/7 with CERT or public safety personnel, equipped them with public safety radios, and instructed the public to go to any fire station in an emergency, should they be unable to reach the 911 center.[38]

Following Japan's 2011 "triple disaster" of earthquake, tsunami and nuclear crises, newspaper reporters created handwritten posters with important information for victims and posted them in gathering places (described in further

35 Kentucky Public Service Commission, *Ike and Ice: Report on the September 2008 Wind Storm and the January 2009 Ice Storm*, 166.

36 City of Grand Forks, *Grand Forks Flood Disaster and Recovery Lessons Learned*.

37 Donnellan, "*Derecho*: Recovering from Catastrophic Storms."

38 Ibid.

detail in Chapter VI).[39] In the aftermath of the 2008 New Hampshire ice storm, local general stores, and gas stations became information hubs.[40]

In its robust Resilient Communications guide, the United Kingdom's Cabinet Office suggested using modern technologies, including alerting systems and social media, but also cautioned that "more traditional" methods also be employed where needed, including sirens, door knocking and bullhorns.[41]

## E. SIGNIFICANT GAP IN THE LITERATURE

A number of reports acknowledged the important role that communications play in a crisis, yet did not address how official sources could convey important information to the public during a major power outage.

On August 14, 2003, a sagging transmission line in Ohio touched a tree branch, triggering a cascading power outage that left 50 million people in the dark in eight U.S. states and two Canadian provinces. In its report on the blackout, the Michigan Public Service Commission included a section on Public Information Needs. The report acknowledged, "One of the most important crisis management actions state government takes during an emergency is to provide information to the public." Despite this statement, the report did not address public communications.[42]

The Michigan report discussed "full and robust" communications between government agencies and focused on the Commission's role in sharing information with the Governor. During the crisis, the Commission provided regular updates to the Governor's office, as well as to the local, regional, and national press. The Commission also issued press releases asking Michigan

39 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

40 State of New Hampshire, December 11–12, 2008 Ice Storm: State Response After-Action Report.

41 Cabinet Office, Resilient Communications.

42 Michigan Public Service Commission, Report on August 14th Blackout.

residents to conserve electricity to help reduce demand, but did not address how the public might receive this information.[43]

Although Illinois was not affected by the 2003 blackout, the state commissioned a Special Task Force to prepare for the possibility of a major blackout. The Task Force's "Blackout Solutions" report was quite thorough, yet failed to mention how governments could communicate with its residents during power outages. The focus was on how governments themselves should be prepared.[44] (The 2003 blackout is discussed at length in Chapter IV.)

Following a severe power outage in 2003, the New York City after-action report to Mayor Michael Bloomberg did not cover efforts to communicate directly with the public. Instead, the report focused on City Hall's relationship with media outlets. It described how City Hall lost its ability to send live video directly to television stations, and cited this as a major failure.[45]

A 2008 ice storm devastated New Hampshire, affecting 211 of 234 communities in the state. At the worst point, more than half the state's population was without electric power and the outage was sustained; power was not fully restored for 11 days. A group convened by New Hampshire Governor John Lynch found that sharing critical information with the public proved to be a "significant challenge" during this incident. The incident was long enough that people's battery power was depleted.[46]

With a number of rolling blackouts throughout California in 2001, City of San Jose produced a detailed Annex to its Emergency Operations Plan, specifically for power disruptions. The sections on Public Information and

43 Ibid.

44 Special Task Force on the Condition and Future of the Illinois Energy Infrastructure, Blackout Solutions (Springfield, Illinois: State of Illinois [2004]), http://www.standingupforillinois.org/pdf/BlackoutSolutions/report.pdf.

45 New York City Emergency Response Task Force, Enhancing New York City's Emergency Preparedness: A Report to Mayor Michael R. Bloomberg (New York, New York: City of New York [2003]), http://www.nyc.gov/html/om/pdf/em_task_force_final_10_28_03.pdf.

46 State of New Hampshire, December 11–12, 2008 Ice Storm: State Response After-Action Report.

Advance Warning Information Coordination described how the Public Information Officer will release accurate information to the public, and that City staff will make sure that generators will be fully fueled and operational during power outages.[47] It contained detailed instructions for how staff should be prepared with backup batteries. It did not, however, address how the power-less public could receive this information.

In October 2011, a severe snowstorm in Connecticut resulted in a two-week power outage for nearly 810,000 customers. The state of Connecticut hired the crisis management consulting firm Witt Associates to analyze the disaster and produce a paper. The Witt report concluded that the power company, Connecticut Power & Light, made things worse for itself when it publicized an overly optimistic goal of restoring power to 99 percent of customers by Nov. 6 and then failed to meet this goal. This greatly contributed to customer frustration.[48]

The Witt report did not touch on how emergency managers communicated with residents during this time. It does briefly mention that the utility released information to the public through news media.[49] The report discussed the power company's role in public communications, rather than that of state or local emergency managers.

In an Annex to its Emergency Operations Plan, City of Houston acknowledged that "…many of the normal means of disseminating public

47 Office of Emergency Services, Operations Plan: Annex P, Power Outages (San Jose, California: City of San Jose.

48 Witt Associates, Connecticut October 2011 Snowstorm Power Restoration Report (Washington, DC: Witt Associates [December 1, 2011]), http://www.wittobriens.com/external/content/document/2000/1755443/1/CT-Power-Restoration-Report-20111201-FINAL.pdf.

49 Ibid.

information may be unavailable and alternative methods of getting information out to the public will be necessary." The report did not go further to suggest what those alternative methods might be.[50]

The Pan American Health Organization published a robust manual for disaster response teams that gives good advice on how to manage communications. The manual ignored how a severe power outage might affect the work, with the exception of a single mention that, if electricity and telephone are missing or spotty, the team should find "other systems that will allow information to be collected, produced and disseminated from the affected area."[51] This report did not suggest what those "other systems" might be.

The Department of Homeland Security (DHS) funded a study for the National Capital Region on critical infrastructure, with an emphasis on resilience and interdependencies. One of the study's major findings was the importance of utilities' timely, thorough communications with their customers. Public communications was a small mention in the study, which concluded that when television and the Internet are not available, "something else must be used to fill the gaps," without hinting at what that "something else" might be.[52] It was particularly disappointing that a DHS-funded study on resilience did not attempt to address this problematic communications gap.

**Why does this gap exist?** How is it that so many responsible entities have produced reports that acknowledged the problem of communicating important information to the public during major blackouts, but ignored the need

50 City of Houston, *Emergency Management Plan, Annex L, Utilities* (Houston, Texas: City of Houston Office of Emergency Management [2008]).

51 Ricardo Perez, Martha Rodriguez and Susana Arroyo Barrentes, Information Management and Communication in Emergencies and Disasters: Manual for Disaster Response Teams (Washington, D.C.: Pan American Health Organization [2009]).

52 University Consortium for Infrastructure Protection, Critical Infrastructure Protection in the National Capital Region; Risk-Based Foundations for Resilience and Sustainability; Final Report, Volume 20: Hurricane Isabel: Critical Infrastructure Interdependency Assessment (Fairfax, Virginia: George Mason University [September 2005]).

for solutions? The answer is not clear; this this is an area that is under-researched and would benefit from further exploration and rigorous inquiry.

It is possible that emergency managers think of blackout communications as being someone else's problem; in other words, it is the power company's problem and in the meantime, emergency managers are doing the best they can. Conversely, the power company may think of public communications as being the localities' problem, and that the company is doing its best to restore electricity.

It is also possible that emergency managers find the prospect of addressing this gap to be too daunting, too big a problem to address within existing budgets. If emergency managers were to assume that solutions lie primarily in technological or infrastructure answers, those would, indeed, be expensive solutions.

Whatever the reasons, the gap exists.

By examining emergency communications efforts in three crises, and using the "high-low-no-tech" conceptual framework, this research project addressed this gap and, it is hoped, can help inform emergency managers going forward (see Appendix C for a comparison).

# III. DESIGN AND METHODOLOGY

## A. INTRODUCTION

Before, during and after emergencies, people want timely, accurate information from a trusted source; key trusted sources include local governments and public safety officials. This research project addressed this important communications goal—helping emergency managers share critical life/safety information with the public during a major power outage.

The research project was designed to answer the overall research question:

> *What high-tech, low-tech, and no-tech communication strategies can support public communications during large-scale power outages?*

## B. RESEARCH METHODOLOGY

The structured focused comparison method was used to examine three crises that involved major power outages. This is a straightforward method of evaluating multiple cases. The method is "structured" by asking the same questions of each case, thus enabling comparisons and findings across the cases. The method is also "focused" by only looking at certain aspects of the cases.[53] The structured focused comparison method was ideal for this project, as it enabled a systematic comparison of historic events, focused squarely on issues of public communications, vs. for example, communications between first responders.

The project applied the "high-low-no-tech" conceptual framework to examine the three core communications issues identified in Chapter I. The three core issues are: fragile communications channels, Mismatched information, and collapse of communications infrastructure. For each core issue, the project

53 Alexander L. George and Andrew Bennett, Case Studies and Theory Development in the Social Sciences (Cambridge, Mass.: MIT Press, 2005), 331.

examined the actions different communities took when faced with the loss of primary communications methods in three crises:

- **Multi-state blackout**, northeast U.S., 2003
- **Hurricane Katrina**, New Orleans, 2005
- **Triple disaster**, Japan, 2011

These were chosen to represent a diverse set of cases; they were diverse in terms of causation, geography, and scope. The factors considered:

- **More recent:** Cases selected from the recent past, as the "wired" nature of our modern society is a baseline aspect of our modern world.
- **Geographic:** Selected one case from another country.
- **Scope:** Events chosen were of different scope, though all were major crises that involved multiple jurisdictions.
- **Well-documented:** Chose cases about which much has been written.

All three cases had a number of similarities: all had significant communications breakdowns and difficulties getting critical information to people who needed it. All three incidents were catastrophic in nature, causing a total disruption of the community.

## C. DATA COLLECTION

The project cast a wide net and examined a wide variety of sources including books, government research reports, after-action reports, journal articles, press articles, online articles, online videos, online blogs and websites. Wherever possible, the focus was on first-hand accounts, well-sourced reports, and peer-reviewed academic writings.

Most sources were written retrospectively, after the crisis was over; the writers had the advantage of hindsight and more accurate data. During crises, many of the immediate articles tended to have incomplete information and therefore were less useful to this project. Press reports were from media outlets from the affected area, as well as outside the affected area.

To address the overall research question, the following sub-questions were useful in reviewing the cases:

**Basic information**

1. What happened?
    - What is the basic description of the incident?

**Communications**

2. How were communications impacted?
    - Were any channels open / available?
3. How did the public receive important information during the crisis?
4. What went well?
    - What factors were present that affected the outcome in a positive way?
5. What went poorly?
    - What factors were present that affected the outcome in a negative way?
6. What are the lessons learned?
    - Any good ideas / solutions that emerged?
    - Did people make use of "old-school" methods and, if so, how were they used?
    - Did people make use of new technologies and, if so, how were they used?

**Additional**

7. What is the relationship between people's level of technical dependence and their resilience during severe power outages?

A description of how these questions helped to address the overall research question is in Appendix B.

## D. DATA ANALYSIS

The researcher collected, reviewed and analyzed literature for each of the three cases. For each, the project sought to address the research question, by asking the above-mentioned sub-questions, specifically looking for information that addressed the three core communications issues (fragile communications channels; Mismatched information; and collapse of communications infrastructure).

The results of this analysis are presented in each case study's chapter. High-level information on how the "high-low-no-tech" addressed the three communications issues is summarized in a table in Appendix C.

## E. DEFINITIONS

Terms as used in this paper are defined in Appendix A.

# IV. CASE STUDY—2003 NORTHEAST BLACKOUT

## A. THE EVENT

On August 14, 2003, a perfect storm of high temperatures, high demand, obsolete equipment, human errors and miscommunication triggered the worst power blackout in U.S. history. The cascading power outage left 56 million people in the dark in eight U.S. states and two Canadian provinces.[54] (Figure 1)

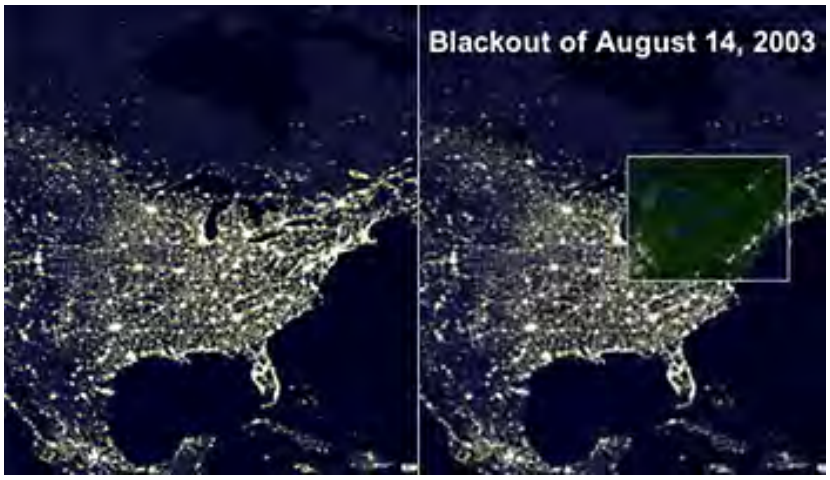


Figure 1. Blackout of August 14, 2003 (from NASA and Columbia University's Earth Institute, 2003)

The blackout shut down 100 power plants, closed 12 airports, and is estimated to have cost up to $6 billion.[55] The power outage gridlocked New York City, Albany, Syracuse, Buffalo, Rochester, Erie, Cleveland, Detroit, Toronto, Ottawa and hundreds of cities and towns across Ohio, Michigan, Indiana, Pennsylvania, New York, New Jersey, Connecticut, Vermont, Ontario and Quebec.[56]

54 Stephen Graham, *Disrupted Cities: When Infrastructure Fails* (New York: Routledge, 2010).

55 Special Task Force on the Condition and Future of the Illinois Energy Infrastructure, Blackout Solutions.

56 Graham, *Disrupted Cities: When Infrastructure Fails*.

In New York City, 12,000 traffic signals lost power simultaneously, instantly gridlocking traffic. More than 400,000 people were stranded when 413 trains lost power.[57] Manhattan hotel guests slept on the street when their electronic key cards stopped working.[58] Power was not restored to parts of the affected areas for four days. Sections of Ontario suffered rolling blackouts for more than a week.[59]

Medical researchers reported that the blackout resulted in increased health risks, including respiratory disease and death, particularly among the elderly and those with compromised health conditions.[60] In some areas, power outages shut down water pumps in the city's drinking water systems; the low pressure prompted health officials to issue boil-water advisories, including the Cleveland, Ohio area.[61]

Interestingly, even though the "normal accident" cascading scenario has been thoroughly studied and validated, al-Qaeda initially took credit for the power outage, "to hit the pillars of the U.S. economy." Despite these claims, there is no evidence of any such terrorist activity related to the 2003 blackout.[62]

**Communications problems abound:** While the global Internet remained stable throughout the blackout, thousands of corporate and institutional networks

57 NYC Office of Emergency Management, NYC Heat and Power Emergency Preparedness (Brooklyn, NY: City of New York Office of Emergency Management [2003]), www.gnyha.org/319/File.aspx.

58 CBS, "CBS Evening News, 2003 Northeast Blackout," YouTube video, http://www.youtube.com/watch?v=0uza1fQZy4c.

59 U.S.-Canada Power System Outage Task Force, Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations (Ottawa, Canada: Natural Resources Canada [2004]), http://energy.gov/oe/downloads/blackout-2003-final-report-august-14-2003-blackout-united-states-and-canada-causes-and.

60 Shao Lin et al., "Health Impact in New York City during the Northeastern Blackout of 2003," *Public Health Reports* 126, no. 3 (May–Jun, 2011): 384–393.

61 David Snyder and Eric M. Weiss, "Rolling Power Outages Shut Off Water Supply," *The Washington Post*, August 16, 2003.

62 U.S.-Canada Power System Outage Task Force, Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations.

and millions of individuals were offline for hours or days. Affected organizations included federal, state and local governments; banks; businesses; hospitals; and Internet service providers.[63]


Figure 2. With telephone service largely unavailable, New Yorkers lined up in long queues to use public telephones[64] (from Associated Press 2003)

Telephone service was hit hard in the affected area. Mobile networks failed, due in part to heavy traffic, but also due to lack of electricity and failure of backup power supplies. Landline telephone service was also affected when call volume surged to 300 percent above normal levels in the New York City area. Even when landline service was available to individual homes, fancy equipment—particularly cordless phones—could not work without electric power.[65]

Following the blackout, a number of official reports acknowledged communications problems, but few included solutions to these problems.

63 J. Cowie et al., "Impact of the 2003 Blackouts on Internet Communications," Preliminary Report, Renesys Corporation (updated March 1, 2004, 2003), http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.183.998&rep=rep1&type=pdf.

64 BBC News, "Blackouts Cause N. America Chaos," BBC News, http://news.bbc.co.uk/2/hi/americas/3152451.stm (accessed June 10, 2013).

65 Matt Richtel and Simon Romero, "The Blackout of 2003: Communications—when Wireless Phones Failed because of Heavy use, Callers Turned to Land Lines," *The New York Times*, sec. Business Day, August 15, 2003, http://www.nytimes.com/2003/08/15/business/blackout-2003-communications-when-wireless-phones-failed-because-heavy-use.html?src=pm.

New York City's after-action report to Mayor Bloomberg did not cover efforts to communicate directly with the public. Instead, the report focused on City Hall's relationship with media outlets. It described how City Hall lost its ability to send live video directly to television stations, and cited this as a major failure. The report also recommended centralizing all information to flow through City Hall's press office, which should then disseminate the information to every outlet available.[66]

Another recommendation is that New York City government should strengthen its communications and relationships with businesses. And the reports recommended establishing a microwave or satellite link from City Hall to the City's television broadcast tower, to be able to broadcast directly to television stations, without depending on fiber lines or backup power.[67]

Although Illinois was not affected, the state commissioned a Special Task Force to prepare that state for the possibility of a blackout. The Task Force's "Blackout Solutions" report was quite thorough, yet failed to mention how governments would communicate with its residents during power outages. The focus was on how the governments themselves should be prepared.[68]

Although the blackout caused many problems, emergency communications with the public did not appear to be a serious problem, possibly due to the relatively short duration of the blackout, which was approximately four days in most areas.[69]

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66 New York City Emergency Response Task Force, Enhancing New York City's Emergency Preparedness: A Report to Mayor Michael R. Bloomberg, 14.

67 Ibid.

68 Special Task Force on the Condition and Future of the Illinois Energy Infrastructure, "Blackout Solutions," June 2004, http://www.standingupforillinois.org/pdf/BlackoutSolutions/report.pdf.

69 U.S.-Canada Power System Outage Task Force, Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations.

## B. ADDRESSING THE THREE CORE COMMUNICATIONS ISSUES

Successes are documented in the three core issue areas.

**Area Number 1: Fragile communication channels.** Though most electricity-powered communications methods were knocked out by the power outage, text messaging did work.[70]

While many people jockeyed to use working landline pay phones, New York-based Omnipod reported that its instant messaging (IM) services worked uninterrupted throughout the power outage. Customers with IM accounts were able to communicate with each other throughout the incident.[71] Omnipod, which operated primarily in the New York area, reported a 30–35 percent increase in its instant-messaging traffic as soon as the blackout hit.[72]

Social media were not available on the communications menu at the time of the 2003 blackout. Facebook launched in February 2004[73] and Twitter launched March 2006.[74]

**Area Number 2: Mismatched information.** Some residents did better than others, particularly those who had enough foresight to have on hand battery-powered radios and flashlights, and matches to light a gas stove or candles. Old-fashioned hard-wired telephones worked throughout the blackout, but most people had upgraded to fancier cordless models with built-in voice-mail,

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70 Text messaging sends data in little packets, which do not need continuous network access; in addition, the messages travel through paths that are reserved for data only, are less congested, and more likely to be delivered successfully. Source: Cory Young, "S.O.S. Via SMS: Text Messaging as a Communication Strategy in Hurricane Crises," *Journal of Communication Studies* 1, no. 3–4 (Summer/Fall, 2008), 197–216, http://faculty.ithaca.edu/youngc/docs/Publications/SOS_via_SMS.pdf.

71 Ilena Armstrong, "Unprepared Companies were Left in the Dark," *SC Magazine* 14, no. 9 (2003), 18-18.

72 Carmen Nobel and Caron Carlson, "Blackout Makes Communicating Difficult," eWeek 20, no. 34 (08/25, 2003), 13.

73 Sid Yadav, "Facebook—the Complete Biography," Mashable, http://mashable.com/2006/08/25/facebook-profile/ (accessed June 23, 2013).

74 Biz Stone, "Happy Birthday Twitter!" Twitter, https://blog.twitter.com/2011/happy-birthday-twitter (accessed June 23, 2013).

and these did not work. RadioShack's Manhattan store on 21st Street and Park Avenue did a brisk business selling battery-powered radios, flashlights and old-fashioned telephones—to customers who brought cash, as electronic cash registers did not work.[75]

For most residents throughout Ontario, their only source of news for the first two days of the blackout was through battery-powered radios. Local radio broadcaster CHUM Radio Ottawa consolidated all of its programming and delivered the same broadcast over its four stations (three FM stations and one AM station), providing around-the-clock coverage.[76]

Ontario's *Marketing Magazine* reported that the 2003 blackout sparked resurgence in radio as a medium, with strangers huddled around car radios. People with battery-powered radios seemed as "god-like as cavemen with a Bic lighter." BBC Canada reported that daily listening time doubled.[77]

In a book about the history of blackouts in America, author David Nye described how people immediately suspected terrorism as the cause of the August 14 blackout, coming as it did just two years after the Sept. 11, 2001 attacks on New York and the Pentagon. But, he wrote, "Fortunately, radio news stations had standby power and informed listeners that the blackout was only what it appeared to be," thus averting panic.[78]

A bright spot during the blackout was the region's network of amateur radio operators, known colloquially as "Ham" radio—a technology from the World

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75 Susan Warren and Melanie Trottman, "When Plug is Pulled on the Digital Age, the Basics Black Out; Like Auto-Flush Toilets, ATMs and, for One Pizza Man, A Power Cheese-Shredder," *Wall Street Journal*, sec. A, August 18, 2003, http://search.proquest.com.libproxy.nps.edu/docview/398808402.

76 Public Safety and Emergency Preparedness Canada, Ontario-U.S. Power Outage: Impacts on Critical Infrastructure; Incident Analysis no. IA06-002 (Ottawa, Canada: Canadian Government [2006]), https://www.hsdl.org/?view&did=698352.

77 Andrea Zoe Aster, "Radio's New Wavelength," *Marketing Magazine* 109, no. 4 (02/02, 2004), 7–8.

78 David E. Nye, *When the Lights Went Out: A History of Blackouts in America* (Cambridge, Massachusetts: The MIT Press, 2010), 292.

War I era.[79] Ham operators are trained and pass stringent testing to earn their permits. Most communities in the U.S. have active ham radio groups who regularly practice their skills, frequently exercising with local public safety and emergency managers.[80]


Figure 3. Long Island's Tom Carrubba coordinated Hams in New York City's five boroughs and two counties (from Louis Lanzano, Associated Press 2013)

A sampling of the ways in which Ham radio operators helped to fill the information void:[81]

- A quickly formed informal network on Long Island, NY passed hundreds of messages, including information on bridge/tunnel closures, traffic conditions, which stores or gas stations were open.
- In the metropolitan New York City area, when a hospital lost all power, Ham radio operators provided all its communications with ambulances.
- In New York City, Ham teams provided communications for Red Cross Emergency Responsible Vehicles, including accompanying them on fire calls.

79 Stephen Singer, "Ham Radios Came to Rescue in Blackout," Associated Press, August 26, 2003, http://www.eham.net/articles/6333.

80 Andrew Boggs, "The Role of Amateur Radio in Disaster Communications," Ice-Pack: Emergency Preparedness Systems, http://www.ice-pack.com/EP_news/2010/11/the-role-of-amateur-radio-in-disaster-communications/.

81 American Radio Relay League, "Hams a Bright Spot during Power Blackout," QST 87, no. 10 (October, 2003), 79–80. http://libproxy.nps.edu/login?url=http://search.proquest.com.libproxy.nps.edu/docview/228570780?accountid=12702.

- In New Jersey, Ham operators connected Red Cross chapters to each other.
- In upstate New York, Ham teams provided communication for local emergency managers when they lost all regular communications modes.
- In Michigan, Ham teams also supported local emergency operations and the local Red Cross operations.
- In Ohio, all northern Ohio amateur radio organizations were activated. Teams in Cleveland, Akron, and other cities handled communications for Ohio Emergency Management.
- In Connecticut, Ham operators relayed information between Red Cross operations in Farmington, CT and New York City.
- Ham operators in Bethel, CT supported local emergency response.

Chris Poirier of GovLoop, an online community for public sector professionals, commented on how useful Hams can be in crises: "Most times when the power grid goes down Hams are the only one's on *[sic]* the area and passing information. Hams can even push data and video with minimal to no grid power during an emergency. In other words, when the lights go out, they are still on, thus making them great partners in the effort."[82]

Poirier also made the case that, if emergency managers need volunteer help to implement social media communications platforms, Hams are well suited to the task. Hams love new technology, understand incident command, and engage in regular training.[83] Ham operators cannot broadcast to a mass (public) audience, but have proven invaluable to the responder community.

Print media continued to operate, using generator power, or were able to switch operations to other offices in unaffected areas. [84]

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82 Chris Poirier, "The Emergency Communications Catalyst: Social Media Meets Amateur Radio," Gov Loop, http://www.govloop.com/profiles/blogs/the-emergency-communications-catalyst-social-media-meets-amateur.

83 Ibid.

84 Public Safety and Emergency Preparedness Canada, *Ontario-U.S. Power Outage: Impacts on Critical Infrastructure; Incident Analysis no. IA06-002*.

**Area Number 3: Collapse of communications infrastructure.** CBS anchor Dan Rather described the massive blackout as a time of getting "back to basics," as people relied on the sun for light and feet for transportation.[85]

Crain Communications, which publishes *Advertising Age* and *Crain's New York Business*, among others, managed to continue coverage through the blackout by writing stories in longhand and dictating them to colleagues in the company's Los Angeles office. Publisher and editorial director David Klein remarked, "…the older your technology, the better off you are."[86]

## C. COMMUNICATIONS FAILURES

The consensus seemed to be that state and local governments had done a good job of preparing for a massive emergency, and that the emergency response had generally gone very well. However, it seems that residents—New Yorkers at least—were not properly prepared themselves to weather a major emergency. Department of Homeland Security officials "gingerly" reminded news media of its "widely ridiculed" advice for residents to stock up on emergency supplies. Such supplies included batteries and radios.[87]

In Ontario, television coverage continued, but due to the blackout, many viewers in the affected areas could not view the broadcasts. TV coverage thus was more useful to keep the rest of the nation informed of the disaster.[88]

**Telecommunications failures:** Communications problems also affected response workers. New York City's Department of Health and Mental Hygiene reported that its employee call center struggled with having enough battery back-up to power call center telephones. Initially, 800-megahertz radios helped with

85 CBS, *CBS Evening News, 2003 Northeast Blackout*.

86 Rance Crain, "Crain in Blackout Bull's-Eye, but we Still Got the News Out," *Advertising Age*, sec. 74, August 25, 2003.

87 Michael Hirsh and Daniel Klaidman, "What Went Wrong," *Newsweek*, August 25, 2003, 32.

88 Public Safety and Emergency Preparedness Canada, Ontario-U.S. Power Outage: Impacts on Critical Infrastructure; Incident Analysis no. IA06-002.

internal communications, but their use was limited to the life of the battery. Without use of computers, the department also struggled with preparing press releases and health advisories; the report recommended being prepared with hard-copy releases ahead of time.[89]

Ontario's telephone networks generally reported few difficulties, but did need generator fuel to maintain the system, including the 911 system; this was an area of real concern throughout the incident. Customers also experienced problems with pagers, which failed at times, including at St. John's Ambulance service. Canadian cellular phones were problematic, with networks being overloaded during the blackout with high volume usage. Because of the many problems during the 2003 blackout, in 2004, the Government of Canada introduced Wireless Priority Service (WPS) for public safety, first responders, and emergency managers, giving them priority access to cellular network for emergencies.[90]

Mobile phone service was also hit hard in the U.S. After the Sept. 11, 2001 terrorist attacks, the cellular industry had promised to upgrade networks in order to improve its performance during emergencies, and came under fire for the massive service failures in the 2003 blackout. Cellular sites had backup battery power, but it only lasted a few hours before needing recharging. Though landlines generally stayed in service throughout the blackout, many customers had switched from landlines to wireless service.[91]

While on a business trip to Cleveland, a vice president of a two-way radio company experienced the 2003 blackout first-hand when his hotel had no back-up power. His conclusion: "A two-way communications system independent of

89 Mark E. Beatty et al., "Blackout of 2003: Public Health Effects and Emergency Response," *Public Health Reports* Vol. 121, no. 1 (January-February 2006): 36-44, http://www.jstor.org.libproxy.nps.edu/stable/20056912.

90 Public Safety and Emergency Preparedness Canada, Ontario-U.S. Power Outage: Impacts on Critical Infrastructure; Incident Analysis no. IA06-002.

91 Andrew Ross Sorkin and Matt Richtel, "Cellphone Failures Cause Many to Question Systems," *New York Times* 152, no. 52577 (August 16, 2003), B7.

the power grid should be an important part of any private, public or government emergency plan."[92] Granted, he is biased toward his own company's and industry's products, but it was worth noting his recommendation that every business and organization be prepared to communicate when the power goes out.

New York City's 911 system failed in several ways. The high call volume overloaded the system, and backup generators at several Verizon offices failed, knocking out 911 service for some minutes.[93]

**Vulnerable power grid:** Many experts have pointed out that the scope, age and complexity of our nation's power grid makes it sensitive to accidents. Our nation is almost certainly going to experience power outages for the foreseeable future; some of the outages will be catastrophic. One expert has commented that, when something does go wrong, "…the dominoes can start to fall over a wider and wider area."[94]

And, ominously, experts have concluded that disrupting the grid through a deliberate act of terrorism would be "ridiculously easy."[95]

## D. SUMMARY

An analysis of the 2003 Blackout in the context of the "high-tech, low-tech, and no-tech" conceptual framework revealed that for each of the three core communications issues, people did manage to communicate successfully.

In the first area of fragile communications channels, the high-tech tool of instant messaging helped people stay in touch with each other, despite loss of telephone and mobile service. In the second area of Mismatched information,

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92 *Chris Lougee, "An Ounce of Prevention," Mobile Radio Technology* 25, no. 2 (February 2007): 22–22.

93 Michael Cooper, "After Blackout, a Call for a 911 Overhaul," *New York Times*, sec. 153 October 29, 2003.

94 James Glanz, "Its Coils Tighten, and the Grid Bites Back," *New York Times*, August 17, 2003.

95 Ibid.

low-tech methods filled an important gap; local radio reached the community, and Ham radio operators served as invaluable partners for first responders. In the third area of communications infrastructure collapse, people went “back to basics” to get the job done.

# V. CASE STUDY—HURRICANE KATRINA

## A. THE EVENT

The day before Hurricane Katrina hit the Gulf Coast on August 29, 2005, the National Weather Service in Slidell, Louisiana issued an alert that included this ominous warning:

> *Most of the area will be uninhabitable for weeks … Perhaps longer … Water shortages will make human suffering incredible by modern standards.*[96]

Sadly, this prediction turned out to be completely accurate.

Figure 4. Image of Hurricane Katrina (from NOAA 2005)

Hurricane Katrina was one of the most devastating disasters in U.S. history. It was the third-deadliest hurricane since 1900, with more than 1,800 fatalities.[97] Thousands of homes and businesses were obliterated. Entire neighborhoods were destroyed. The hurricane spawned 43 tornadoes and storm

96 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

97 Richard D. Knabb, Jamie R. Rhome, and Daniel P. Brown, *Tropical Cyclone Report: Hurricane Katrina, 23–30 August 2005* (Miami, Florida: National Weather Service/National Hurricane Center [2005]), http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf.

surge caused flooding throughout the entire Gulf Coast. The disruption is hard to comprehend; 1.1 million people were evacuated and 770,000 people were displaced from their homes.[98]

The damage and devastation to the city of New Orleans is well known, but Katrina also caused tremendous damage to other parts of Louisiana, as well as Mississippi, Alabama, Georgia, and Florida.[99]

In Mississippi, Katrina brought a blender-like storm surge, which extended up to 10 miles inland, and as high as 34 feet. More than half the state, which suffered catastrophic wind and water damage, was without power. The storm killed at least 230 people and displaced nearly 200,000 Mississippians from their homes. The storm wreaked havoc in other ways; for example, it killed more than three million chickens. A month after Katrina hit, 19,000 households remained without electric power.[100]

Alabama did not suffer a direct hit, but still experienced a wave surge of 13.5 feet, which caused significant damage along the coast. Two people died, more than 1,000 homes were destroyed, and a drilling platform was dislodged and caught under a highway bridge.[101] Under normal circumstances, this damage alone would have been national news.

New Orleans' losses were overwhelming. The city's levee system failed; at peak, 80 percent of the city was flooded, in some places 20 feet deep.[102] (Figure 5)

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98 Executive Office of the President, *The Federal Response to Hurricane Katrina: Lessons Learned* (Washington, D.C.: White House [2006]).

99 Knabb, Rhome, and Brown, *Tropical Cyclone Report: Hurricane Katrina, 23-30 August 2005*.

100 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

101 Ibid.

102 Ibid.

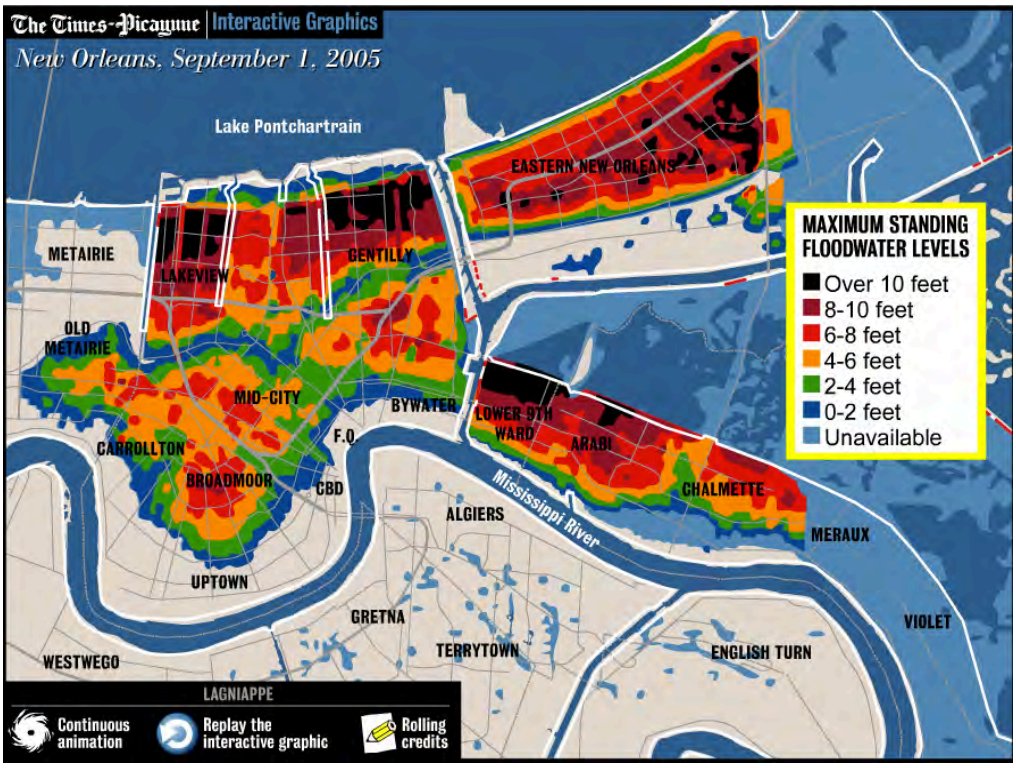


Figure 5. Extent of flooding in New Orleans (from *Times-Picayune* 2005)

Louisiana had 1,100 storm-related deaths, mostly due to storm surge flooding. In addition, contaminated floodwaters posed another threat; *E.coli* bacterial infections killed five people.[103]

Across the region, the hurricane affected a huge number of people; more than 1.2 million people were under evacuation orders. The devastation was difficult to quantify, but in terms of insured losses alone, Katrina caused $41.1 billion in damages.[104]

**Infrastructure damaged:** Across the region, infrastructure was hit hard. In the city of New Orleans alone, the hurricane left more than 3 million without power, some for several weeks.[105] Customer power lines were knocked down

103 Ibid.

104 Knabb, Rhome, and Brown, *Tropical Cyclone Report: Hurricane Katrina, 23–30 August 2005*.

105 Ibid.

across the region; in Mississippi alone, more than 50,000 customer utility pole were destroyed.[106] A full month after Katrina hit, more than 260,000 customer lines remained out of service, 238,000 in Louisiana and 22,000 in Mississippi.[107] In his book *Disrupted Cities: When Infrastructure Fails*, author Stephen Graham wrote about Hurricane Katrina and the "major breakdowns in social order" that resulted in New Orleans, due to the loss of infrastructure in that city.[108]

**Communications problems abound:** Communications across the Gulf Coast region failed as the waters rose. The White House report on Hurricane Katrina described the loss of core communications infrastructure across the region as "unprecedented."[109] According to some observers, communications became the "biggest problem of the catastrophe."[110]

Telephone service—both landline and cellular—was virtually nonexistent for days because of flooding, power outages, and equipment theft.[111] Nearly three million customers lost telephone service.[112] Wireless service was also hard hit; at peak, 2,000 cell sites were out of service. A month later, 820 cell sites were still out of service, most within New Orleans and parts of Louisiana.[113] Satellite phones failed when water shorted out ground-based transponders.

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106 Executive Office of the President, The Federal Response to Hurricane Katrina: Lessons Learned.

107 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

108 Graham, *Disrupted Cities: When Infrastructure Fails*.

109 Executive Office of the President, The Federal Response to Hurricane Katrina: Lessons Learned.

110 Christopher Cooper and Robert Block, *Disaster: Hurricane Katrina and the Failure of Homeland Security*, 1st ed. (New York: Times Books, 2006), 333.

111 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

112 Executive Office of the President, The Federal Response to Hurricane Katrina: Lessons Learned.

113 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

Emergency services were severely hampered by damage to the region's 911 systems. In 13 counties in the region, 911 services were down in 38 call centers. A month after the hurricane, two 911 centers in Louisiana remained out of service.[114]

Two additional examples of the total breakdown of communications: National Guard and first responders were forced to rely on face-to-face communications or on people running paper messages back and forth; both tactics were popularly used during the Revolutionary War.[115] Another example: Louisiana State Senator Robert Barham, chairman of the State Senate's homeland security committee, summed up the situation in Louisiana: "People could not communicate. It got to the point that people were literally writing messages on paper, putting them in bottles and dropping them from helicopters to other people on the ground."[116]

## B. ADDRESSING THE THREE CORE COMMUNICATIONS ISSUES

Many people have written about the many communications breakdowns after Hurricane Katrina struck. However, there were a few bright spots. As was the case in the 2003 Blackout, research discovered successes in each of the three core communications issue areas.

**Area Number 1: Fragile communication channels.** With infrastructure devastated in the region, voice communications were largely impossible. In

114 Ibid.

115 Ibid.

116 Executive Office of the President, The Federal Response to Hurricane Katrina: Lessons Learned.

Mississippi, some responders in Mississippi were able to communicate on a limited level using satellite phones.[117] In other instances, however, satellite phones were not usable, due to cloud cover.[118]

Despite virtually non-existent telephone voice service, text messages from cellphones worked well. For example, officials at Tulane University in New Orleans realized that, though they had lost all voice communications, they could still communicate with each other via text messaging. This helped them to track down evacuees, to share information with each other, and to ask unaffected staff to update the Tulane website.[119]

Text messaging also helped the relief effort. The Association of Community Organizations for Reform Now (ACORN) used text messaging to send messages requesting help around the country, and received 200 replies.[120] Mobile phones helped in other ways, too. They enabled many Gulf Coast residents to serve as citizen journalists, disseminating photos and video.[121]

The Internet helped people find each other. ACORN set up a message board on its website that helped people to contact one another. At some evacuation centers, people searched websites to find missing family members. And New Orleans native and Yahoo! Chief Executive Officer David Filo developed a metasearch engine that concurrently searched all websites created to find missing persons.[122]

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117 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*

118 Young, *S.O.S. via SMS: Text Messaging as a Communication Strategy in Hurricane Crises*, 197–216.

119 Ibid.

120 Garnett and Kouzmin, Communicating Throughout Katrina: Competing and Complementary Conceptual Lenses on Crisis Communication, 171–188.

121 Ibid.

122 Ibid.

At the time of Hurricane Katrina, Google had recently released a new service called Google Maps. People used this tool to build flood and damage information maps, and take advantage of crowd-sourcing opportunities (see Figure 6).[123]

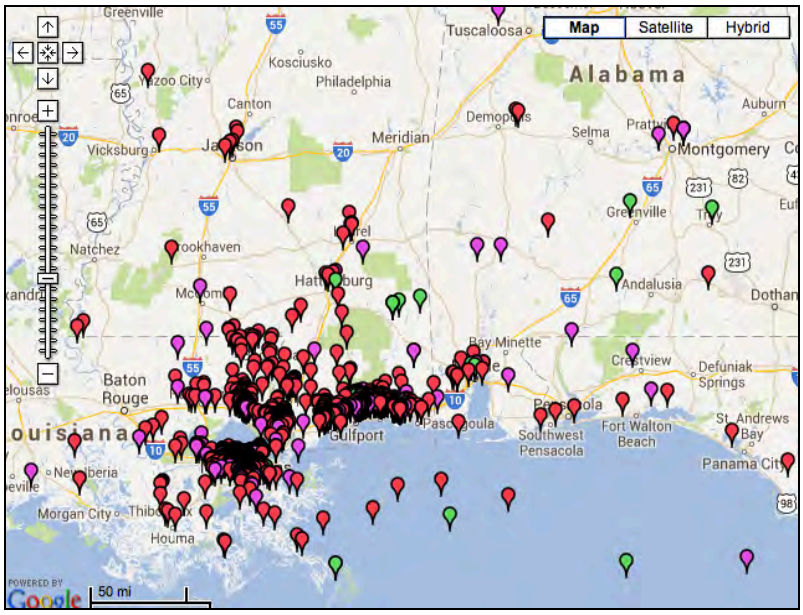


Figure 6. Many people shared information on crowdsourced mapping tools. This map shows information about locations affected by Katrina (from Google Maps 2005)

Social media did not play a role in the Hurricane Katrina response. Twitter had not yet been invented (2006),[124] and Facebook was just beginning to expand beyond its Ivy League roots, having launched February 2004.[125] At the time of Katrina, blogs were the primary social media used to share information, such as rescue efforts, missing people, community information, and relief efforts.

123 Arifumi Utani, Teruhiro Mizumoto, and Takashi Okumura, How Geeks Responded to a Catastrophic Disaster of a High-Tech Country: Rapid Development of Counter-Disaster Systems for the Great East Japan Earthquake of March 2011 (Tokyo, Japan: Association for Computing Machinery [2011]).

124 Stone, Happy Birthday Twitter!

125 Yadav, Facebook—the Complete Biography.

Some private efforts were significant. Vanguard Technologies, a small Louisiana business, provided Saint Bernard and Plaquemines parishes with Internet protocol (IP) network solutions and Point of Presence (POP) Internet connectivity, which remained fully operational during Katrina. Vanguard also deployed a fully operational wireless broadband IP network, covering more than 100 square miles, within five days of Katrina's Gulf Coast landfall. Vanguard Technologies, Inc., "showed up the day after the storm and provided communications when we had none," said St. Bernard's Parish officials.[126]

The Internet played a huge role in relief donations. In the aftermath of Hurricanes Katrina and Rita, 13 million Americans made online donations to relief efforts; another seven million people set up their own online hurricane relief efforts. Individuals donated a total of $4.25 billion in response to Katrina.[127]

**Area Number 2: Mismatched information.** Broadcast media were hit extremely hard. In the region, 50 percent of area radio stations and 44 percent of area television stations were damaged and off the air.[128] At the time of the Katrina disaster, New Orleans had 41 broadcast radio stations. Of these, 37 were knocked out, but four stations continued to operate; two AM and two FM.[129]

The radio stations that did operate provided situational awareness to emergency managers and provided valuable information to the community.[130] For example, in eastern New Orleans, Pastor Vien Nguyen supported 350 parishioners throughout the event in the Mary Queen of Vietnam church. The

126 Executive Office of the President, The Federal Response to Hurricane Katrina: Lessons Learned.

127 Charity Navigator, "Hurricane Katrina: Katrina's Impact," Charity Navigator, http://www.charitynavigator.org/index.cfm/bay/katrina.facts.htm.

128 Executive Office of the President, The Federal Response to Hurricane Katrina: Lessons Learned.

129 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

130 Ibid.

church lost power, but Father Nguyen had stocked it with supplies and a battery-powered radio, which provided the flock with news and updates.[131]

Amateur radio—known colloquially as “Ham” radio—was one of the few technologies that worked throughout. The National Communications System (NCS) is an interagency group of 23 federal departments and agencies that date to the Cuban Missile Crisis in 1963. Following Katrina, NCS coordinated nearly 1,000 volunteer Ham radio operators, who provided invaluable assistance for rescue and relief efforts for government agencies, Red Cross and Salvation Army.[132]

Ham operators cannot broadcast to a mass (public) audience, but were invaluable in assisting government agencies, Red Cross, and Salvation Army, by sending and receiving messages. The Red Cross deployed Hams to 250 shelter and feeding stations in Mississippi, Alabama and Florida. Hams relayed Red Cross messages to and from the Hancock County (Mississippi) EOC (Emergency Operations Center), and helped the EOC with situational awareness. Ham operators helped evacuees at airports in Texas and Louisiana connect with their families. In Mississippi, FEMA stationed amateur radio operators in evacuation centers, hospitals, and emergency management posts to aid communication.[133]

The Centers for Disease Control (CDC) successfully used Public Service Announcements (PSA). The CDC had made extensive preparations and had pre-written a number of important health messages for the public. However, the collapse of communications infrastructure severely hampered its ability to get this information to the people who needed it. Even a CDC truck loaded with thousands of printed flyers was turned back to Atlanta because roads were

131 Cooper and Block, *Disaster: Hurricane Katrina and the Failure of Homeland Security*, 333.

132 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

133 Garnett and Kouzmin, Communicating Throughout Katrina: Competing and Complementary Conceptual Lenses on Crisis Communication, 171–188.

impassable. One solution that worked was videotaping PSAs in Atlanta, and hand-delivering them to disaster areas. There, the PSAs were aired in hardware stores and evacuation centers—locations where people were gathered.[134]

**Area Number 3: Collapse of communications infrastructure.** With not too many options available, people got inventive.

National Guard commanders relied on old-fashioned runners to relay messages.[135] As Major General Harold A. Cross of the Mississippi National Guard explained, "We've got runners running from commander to commander. In other words, we are going to the sound of gunfire, as we used to say in the Revolutionary War."[136]

In Mississippi, local officials sent staff in cars to run disaster updates between the state capital and the coast.[137] And handmade signs helped get important information to residents (Figure 7).

134 Marsha L. Vanderford et al., "Emergency Communication Challenges in Response to Hurricane Katrina: Lessons from the Centers for Disease Control and Prevention," *Journal of Applied Communication Research* 35, no. 1 (February 2007), 9–25, http://nps.illiad.oclc.org/illiad/illiad.dll?Action=10&Form=75&Value=96592.

135 Marc Landy, "A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina/the Federal Response to Hurricane Katrina Lessons Learned," *Publius* 38, no. 1 (Winter, 2008), 152–165.

136 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

137 Cooper and Block, *Disaster: Hurricane Katrina and the Failure of Homeland Security*, 333.


Figure 7. Handmade sign in Slidell, Louisiana lets people know the water is safe to drink (from Win Hinderson, FEMA 2005)

FEMA assembled 1,400 firefighters from around the country to spread out across the Gulf Coast, to serve as temporary community relations officers and hand out flyers to displaced hurricane victims.[138]

Though the CDC did use its low-tech solution of airing PSAs where people were gathered, ultimately what worked best were in-person visits. CDC deployed 30 health communication and education specialists to local and state health departments in Louisiana, Mississippi and Texas — the largest deployment of communications and education specialists in the history of the CDC.[139] The CDC also partnered with the Salvation Army and local groups, who hand-delivered printed health information to residents.[140]

138 Lisa Rosetta, "Frustrated: Fire Crews to Hand Out Fliers for FEMA," *Salt Lake Tribune*, September 6, 2005.

139 Vanderford et al., Emergency Communication Challenges in Response to Hurricane Katrina: Lessons from the Centers for Disease Control and Prevention, 9–25.

140 Ibid.

## C. COMMUNICATIONS FAILURES

The communications challenges associated with Hurricane Katrina have been well documented.

Basic communications infrastructure failed. Landline and cellular telephone service were virtually nonexistent for days because of flooding, power outages, and theft of equipment. The 911 system was down in 13 counties. Individuals had no real way to communicate, except face-to-face. Even first responders had trouble.[141] Broadcast media were hit hard; 100 television and radio broadcast stations were damaged and off the air.[142]

A comprehensive report from a U.S. House Select Bipartisan Committee concluded that public messages were uncoordinated and confusing, leaving important questions unanswered. Government officials at all levels did not have a unified strategy for communicating with the public.[143] One of the report's key findings was the "lack of effective public communications" and that this failing had led to civil unrest and delayed relief efforts.[144]

The White House report also found that Federal, State and local officials did not coordinate communications efforts and gave contradictory messages to the public. It was several weeks before Joint Information Centers were adequately resourced and able to operate at full capacity.[145]

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141 Garnett and Kouzmin, Communicating Throughout Katrina: Competing and Complementary Conceptual Lenses on Crisis Communication, 171–188.

142 Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, *Report and Recommendations to the Federal Communications Commission* (Washington, D.C.: Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks [2006]).

143 Landy, A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina/the Federal Response to Hurricane Katrina Lessons Learned, 152–165.

144 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

145 Executive Office of the President, The Federal Response to Hurricane Katrina: Lessons Learned.

**Problems in the Superdome:** Officials wrestled with special problems in the two main shelters in New Orleans, the Superdome and the Convention Center. Communications systems failures in the shelters led to an information vacuum and a number of erroneous media reports about looting, gunfire, rape, and murders in the Superdome and the Convention Center. The unchecked media reports spread, leading to exacerbated problems in the centers themselves. These erroneous rumors also hindered rescue efforts, by scaring away truck drivers carrying vital supplies.[146] As the U.S. House Committee found, "Lack of a government public communications strategy and media hype of violence exacerbated public concerns and further delayed relief."[147]

New Orleans Mayor Ray Nagin and Public Superintendent Eddie Compass made the problems even worse, by going on national television and confirming the rumors that in the Superdome, babies were being raped and people were being killed. These rumors ultimately were proven false.[148]

Many evacuees in the Superdome listened to AM radios, which were reporting horrific crimes in the Superdome; this led to panic. Responders were not able to counter the false information. Unfortunately, the Superdome's public address system did not run on generator power and mobile phones did not work. Law enforcement addressed the 20,000 evacuees using bullhorns and face-to-face conversations.[149]

146 Landy, A Failure of Initiative: Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina/the Federal Response to Hurricane Katrina Lessons Learned, 152–165.

147 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

148 Ibid.

149 Ibid.

## D. SUMMARY

An analysis of Hurricane Katrina in the context of the “high-tech, low-tech, and no-tech” conceptual framework revealed that for each of the three core communications issues, people did manage to communicate successfully.

In the first area of fragile communications channels, several high-tech tools helped people communicate, including text messaging, websites, and crowdsourcing. In the second area, Mismatched information, local radio filled an important gap. In addition, Ham radio operators were extremely valuable to the first responder community. In the third area of communications infrastructure collapse, responders used Revolutionary War tactics and handwritten signs.

# VI. CASE STUDY—2011 JAPAN'S TRIPLE DISASTER

## A. THE EVENT

The 9.0 magnitude Great East Japan Earthquake (GEJE) struck Japan on March 11, 2011, at 2:46 p.m. local time.[150] It was the fourth most powerful earthquake to have occurred anywhere on Earth since 1900.[151]

The crisis worsened dramatically when the earthquake was followed by an enormous tsunami, which reached up to 40.5 meters (133 feet) above sea level—well above estimated levels—and devastated the coastline. Compounding the crisis was the third disaster, when the tsunami damaged a nuclear power station, resulting in radioactive fallout.[152]

The earthquake and the tsunami killed 15,365 people, with another 8,206 missing and 5,364 injured. More than 111,000 buildings were destroyed or damaged.[153] Almost a half-million people became homeless in an instant.[154] At

150 Rajib Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication, World Bank, 2012).

151 Peter Mantanle, "The Great East Japan Earthquake, Tsunami and Nuclear Meltdown: Towards the (Re)Construction of a Safe, Sustainable, and Compassionate Society in Japan's Shrinking Regions," Local Environment 16, no. 9 (2011): 823-847, doi:10.1080/13549839.2011.607160. http://www.academia.edu/1146814/The_Great_East_Japan_Earthquake_tsunami_and_nuclear_meltdown_towards_the_re_construction_of_a_safe_sustainable_and_compassionate_society_in_Japans_shrinking_regions.

152 Arifumi Utani, Teruhiro Mizumoto and Takashi Okumura, "How Geeks Responded to a Catastrophic Disaster of a High-Tech Country: Rapid Development of Counter-Disaster Systems for the Great East Japan Earthquake of March 2011" (Tokyo, Japan, Association for Computing Machinery, 2011), http://www.engineeringvillage.com/controller/servlet/Controller?SEARCHID=75055c4f13e7b80fbecM418fprod2con2&CID=quickSearchDetailedFormat&DOCINDEX=5&database=1&format=quickSearchDetailedFormat&tagscope=&displayPagination=yes.

153 Mantanle, The Great East Japan Earthquake, Tsunami and Nuclear Meltdown: Towards the (Re)Construction of a Safe, Sustainable, and Compassionate Society in Japan's Shrinking Regions, 823–847.

154 Yuko Fujigaki and Togo Tsukahara, "STS Implications of Japan's 3/11 Crisis," *East Asian Science, Technology and Society: An International Journal* 5, no. 3 (2011): 381–394, http://muse.jhu.edu/.

the worst point of the disaster, 2.58 million people were without electric power in the three Prefectures most affected—Iwate, Miyagi, and Fukushima.[155]

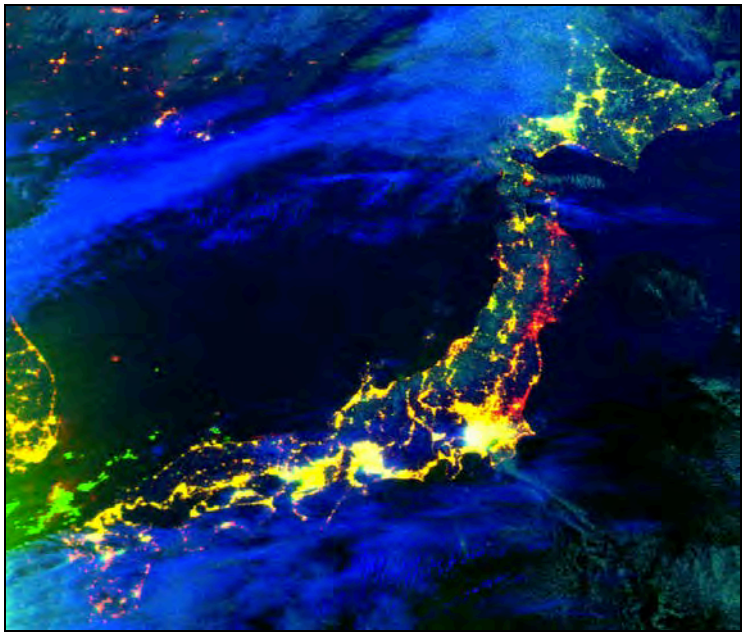

Figure 8. Composite image displaying extent of massive power outage (indicated by red) (from NASA Earth Observatory 2011)

**No power, no phones, no Internet.** The earthquake and tsunami caused massive power outages. A composite satellite image (Figure 8) compared lights observed in 2010 to 2011. Yellow indicates lights that functioned in both 2010 and in 2011, following the disaster. Red indicates power outages on March 12, 2011, compared with 2010.[156]

Japan is a highly developed nation, with sophisticated communications infrastructure. It is one of the top six nations in the world in Internet usage, along

155 National Policy Unit, Road to Recovery: Great East Japan Earthquake (Tokyo, Japan: Government of Japan, 2012), http://www.kantei.go.jp/foreign/policy/documents/2012/icsFiles/afieldfile/2012/03/07/roadtorecovery.pdf.

156 Michon Scott, "Electricity Losses in Northeastern Japan," NASA, http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=49773.

with France, Germany, Korea, United Kingdom and United States.[157] Japan has the world's eighth largest number of mobile phone users.[158]

With its reliance on Internet usage and mobile devices, Japan was hit hard when the massive power outages struck. The crisis caused immense damage to and congestion in telephone infrastructure, including 1.9 million fixed-line services and 29,000 mobile phone base stations. Government radio communication infrastructure was also seriously damaged.[159] Mobile devices worked well until the batteries ran down, unless the person had a way to recharge.

Newspapers' ability to produce and distribute printed papers was severely hindered by problems such as damaged printing presses, lack of electric power, lack of fuel, and lack of transportation.[160]

The disaster also illuminated a generational problem. Younger people had better Internet connectivity and could use mobile devices to get critical information, while older people had less access to information. People over the age of 60 accounted for 65.8 percent of those who died.[161]

**A culture of preparedness:** Many have observed that Japan is among the most prepared nations in the world. Japan has nurtured a culture of preparedness since its devastating earthquake and subsequent fire and typhoon of 1923, which killed more than 100,000 people. Since that time, Japan has

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157 Japan has 101 million Internet users, which represents 79.5% of its population. Source: Internet World Stats, "Top 20 Countries with the Highest Number of Internet Users," Miniwatts Marketing Group, http://www.Internetworldstats.com/top20.htm.

158 Central Intelligence Agency, "Top 10 Lists for Mobile Phone and Internet Usage," U.S. Government, https://www.cia.gov/news-information/featured-story-archive/2012-featured-story-archive/mobile-phone-and-Internet-usage.html.

159 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

160 Lois Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake* (London, England: Internews Europe, 2013), http://www.internews.eu/docs/Publications/InternewsEurope_Report_Japan_Connecting_the_last_mile_Japan_2013.pdf.

161 Ibid.

implemented a number of policies and practices for resilient buildings, regular practice drills, warning systems, coastal city planning, etc. Observers have concluded that the damage and loss from the GEJE would have been much worse without Japan's noted readiness policies.[162]

For example, Japan Meteorological Agency (JMA) sent automatic earthquake alerts seconds before the earthquake hit. These alerts interrupted TV and radio programming and were sent to schools and disaster prevention organizations. Japan is a nation of television watchers (87.2%), which enabled JMA alerts to reach a lot of people. Thanks to improved building codes and a culture of preparedness, few died as a result of the earthquake; 90 percent died by drowning as a result of the tsunami. This compared with the 1995 earthquake in Kobe, Japan, in which 80 percent of deaths resulted from collapsed buildings.[163] To receive the earthquake and tsunami warnings, the most useful methods were wireless public address systems, radio and television broadcasts, and word of mouth.[164]

## B. ADDRESSING THE THREE CORE COMMUNICATIONS ISSUES

A number of communications methods were helpful in the three identified core communications areas.

**Area Number 1: Fragile communication channels.** People used a variety of high-tech methods to cope with loss of electricity, telephone and mobile service; they began using social media almost immediately following the earthquake. With their extensive reach, ease of use and low entry barriers, social media proved enormously helpful. Those who had Internet access posted updates, photos and videos that helped provide valuable information.[165]

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162 Emily Rauhala, "How Japan Became a Leader in Disaster Preparation," *TIME Magazine*, March 11, 2011, http://www.time.com/time/world/article/0,8599,2058390,00.html.

163 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

164 Ibid.

165 Ibid.

Figure 9. Town of Minamisanriku in Miyagi Prefecture, three days after the tsunami hit (from Tsuyoshi Matsumoto, *The Yomiuri Shimbun* via Associated Press 2011)

For example, in the first hour after the earthquake, a Twitter user in southern Japan created a Twitter hash tag (#j-j-helpme) for the earthquake disaster, which served as an initial center point for rescue requests. Later, the Japanese government created hash tags for specific information, such as evacuation centers, and opened its first disaster-related Twitter account.[166]

People shared an enormous amount of information via Twitter; the volume of re-tweets[167] jumped to 20 times higher than the normal rate. An analysis of Twitter usage following the GEJE revealed that people in the disaster-affected areas mostly communicated directly with each other (using direct messages), and that people living outside the affected areas tended to re-tweet.[168]

166 Ibid.

167 “Re-tweeting” means that a Twitter user has shared someone else’s tweet by posting on his/her own Twitter feed.

168 Mai Miyabe, Asako Miura and Elji Aramaki, “Use Trend Analysis of Twitter After the Great East Japan Earthquake” (Seattle, Washington, U.S.A., CSCW '12, February 2012). http://dl.acm.org.libproxy.nps.edu/citation.cfm?id=2141512.2141571&coll=DL&dl=ACM&CFID=330886707&CFTOKEN=23761518.

An analysis of tweets following three major disasters, including GEJE, concluded that Twitter posts about a disaster began at different parts of the network, and very quickly consolidated into a huge connected network that comprised more than 90 percent of Twitter members tweeting. This research also concluded that those tweeting spanned the globe, giving evidence of global concern, which may have some positive prospects for future fundraising.[169]

Google Person Finder launched within 90 minutes of the earthquake. It ultimately mobilized 5,000 volunteers to help create profiles.[170] It was successful because it coordinated its work with authorities, who possessed refugee and casualty information; it ultimately registered 590,000 people, which equaled the total number of refugees. The centralization of information—and avoidance of duplicative, competing efforts—was key to its success.[171] Also on the same day as the earthquake, Google launched its Crisis Response page, a central repository in Japanese, English, Chinese, and Korean.[172]

Twitter also saved lives. Mrs. Naoko Utsumi, 59, escaped the tsunami and evacuated to a community center rooftop, along with 400 others. She had her mobile phone, but was unable to make any calls or send text messages; however, she was able to send an email to her husband. The husband forwarded the email to their son in London; he sent a direct message via Twitter to the Deputy Governor of Tokyo with a plea for help. Within two days, all 400 people were airlifted to safety.[173]

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169 Seema Nagar, Aaditeshwar Seth and Anupam Joshi, "Characterization of Social Media Response to Natural Disasters; from Proceedings of the 21st International Conference Companion on World Wide Web (WWW '12 Companion)" (Lyon, France, ACM, April 2012), doi:10.1145/2187980.2188177, http://doi.acm.org/10.1145/2187980.2188177.

170 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

171 Utani, Mizumoto and Okumura, How Geeks Responded to a Catastrophic Disaster of a High-Tech Country: Rapid Development of Counter-Disaster Systems for the Great East Japan Earthquake of March 2011.

172 Google, "Google Crisis Response: Resources Related to the 2011 Japan Crisis," Google.org, http://www.google.co.uk/crisisresponse/japanquake2011.html.

173 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

Many Japanese residents used Facebook to post “I’m OK” status updates, easing worries from friends and family. The U.S. State Department (via Twitter) recommended contacting loved ones via social media, since telephone lines were down; this method was very helpful in a number of circumstances.[174]

Japanese television broadcasts were also streamed live via commercial streaming services, including Ustream, Niconico Live and Yahoo! It began with a 14-year-old student who live-streamed the NHK TV broadcast on Ustream, using his iPhone. He did this within 17 minutes of the earthquake; a risky move, since such live streaming is illegal in that country. Fortunately, many TV broadcasters themselves followed suit; the live streaming made the live broadcast information available to a much wider audience.[175]

YouTube was successfully used to request assistance. For example, the mayor of Minami-Soma City used YouTube to make a desperate plea for volunteers and relief supplies. It worked; the video resulted in truckloads of relief supplies and an apology from government officials.[176]

Social media was extensively used for search and rescue, as well as for fundraising; it was particularly effective in reaching younger generations.[177]

**Crowd-sourcing:** The Internet enabled a virtual army of volunteers, who helped devise applications and ad-hoc systems to assist with relief efforts. This successful effort included the notable “Hack for Japan,” which coordinated ideas

174 Idisaster2.0: Social media and emergency management, March 12, 2011, http://idisaster.wordpress.com/2011/03/12/social-media-and-the-japan-earthquake-and-tsunami-what-we-can-learn/.

175 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

176 Ibid.

177 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

and development efforts. Because volunteers were, for the most part, off-site, they were unaffected by the devastation and thus able to provide these valuable services.[178]

Volunteers created crowd-sourcing tools, including OpenStreetMap and sinsai.info, an Ushahidi-style crisis map. The volunteers mapped thousands of reports.[179]

Another crowd-sourcing effort has proven to be very successful. Safecast is a volunteer-led project to collect and share radiation measurements; it was created within a week of the Fukushima nuclear disaster. More than 3.5 million data readings have already been mapped, making Safecast the largest radiation-monitoring project in the world.[180]

Social media was very helpful in sharing important information, but proved less useful for relief workers. For example, some Twitter posts were re-tweeted after the victims had already been rescued.[181] Misinformation at times hindered rescue and recovery efforts by diverting precious resources where they were not needed. Additional problems included a lack of discipline in using disaster hash tags; some people tweeted irrelevant information with those hash tags, creating a large number of distracting, irrelevant postings.[182]

**Additional high-tech usage:** Though normal telephone service—both landline and mobile—was severely disrupted, there were some ways in which telephones proved very useful. For example, people used voice messaging to

178 Utani, Mizumoto and Okumura, How Geeks Responded to a Catastrophic Disaster of a High-Tech Country: Rapid Development of Counter-Disaster Systems for the Great East Japan Earthquake of March 2011.

179 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

180 Ibid.

181 Bruce R. Lindsay, *Social Media and Disasters: Current Uses, Future Options, and Policy Considerations*, CRS Report R41987 (Washington, DC: Library of Congress Congressional Research Service).

182 Adam Acar and Yuya Muraki, “Twitter for Crisis Communication: Lessons Learned from Japan's Tsunami Disaster,” *International Journal of Web-Based Communities* 7, no. 3 (2011), 392–402.

confirm whether family members and relatives were safe. People who had smart phones were able to access the Internet and social media tools, as long as they had access to electricity to recharge their devices.

Satellite phones played a crucial role in emergency communication during the response stage.[183] Humanitarian efforts in the stricken region included donations of laptop computers with long-life batteries. Dell and other technology companies donated hundreds of computers to volunteer centers in the affected areas.[184]

**Area Number 2: Mismatched information.** One of the biggest problems was the lack of hyper-local information—information necessary for people's emergency needs, e.g., supplies of food, water, and gasoline.[185] After the JMA earthquake alerts went out, all domestic television channels changed to emergency broadcasting almost immediately. For the first three days, Japan's six major national TV broadcasters devoted 90-plus percent of their programming to coverage of the disaster.[186] Although the broadcasters provided wall-to-wall coverage, it focused on the national nuclear crisis, especially as the extent of the disaster at the Fukushima Daiichi plant became known. This is where hyper-local communication methods—e.g., community radio stations, local newspapers and newsletters—proved most valuable for people's daily needs.

**Radio** proved to be extremely valuable for three major reasons. First, many victims were able to use car radios or radios powered by batteries or hand cranking. Second, radio was particularly useful to older persons, who had less

183 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

184 Dell Inc., "Japan Earthquake and Tsunami; Providing Dell Technology and Employee Ground Support," Dell, Inc., http://www.dell.com/Learn/us/en/uscorp1/corp-comm/japan-earthquake?c=us&l=en&s=corp&delphi:gr=true.

185 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

186 Ibid.

access and inclination to use Internet services.[187] In the Tohoku area alone, 25 emergency broadcast stations were set up to disseminate important information about distribution of emergency food, water, and supplies.[188] The third area of value was that radio was able to provide highly localized information, for example, availability of help for people's everyday needs, as well as information about aftershocks.[189]

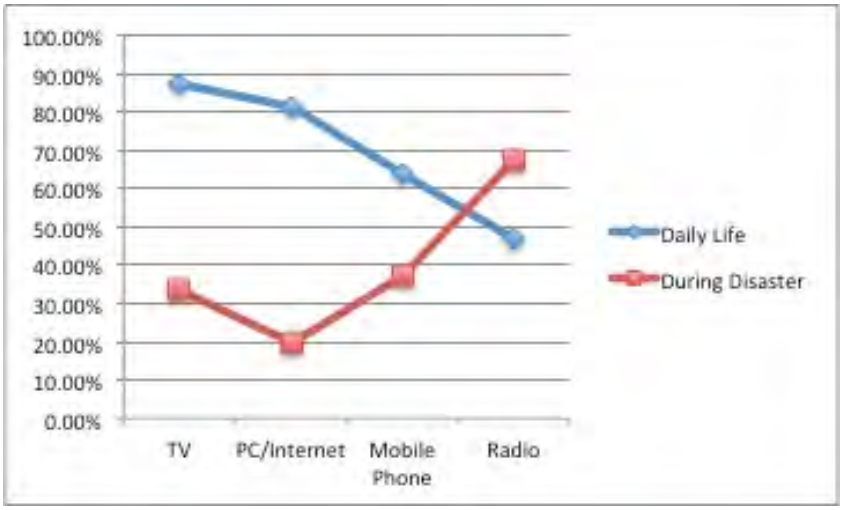


Figure 10. Radio filled an important gap following the GEJE (Data from Appleby, 2013)

It is telling to look at how the Japanese living in the disaster-affected areas used different communications methods before and after GEJE; data show (Figure 10) that radio filled an important gap.[190]

An example: In Yamamoto Town (Miyagi Prefecture), Ringo (Apple) Radio was set up in the Town Hall with the help of a nearby FM station (Figure 11). The station began broadcasting March 21, about 10 days following the earthquake.

187 World Bank Institute, Learning from Megadisasters: The Great East Japan Earthquake (Washington, DC: International Bank for Reconstruction and Development, 2012), http://wbi.worldbank.org/wbi/Data/wbi/wbicms/files/drupal-acquia/wbi/drm_exsum_english.pdf.

188 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication, 9–10.

189 Ibid.

190 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

The station initially broadcast useful information such as bathing times and food rationing. Later, the station transitioned to a source of support and comfort to residents, serving as a vital lifeline to connect the community during a most trying time.[191]


Figure 11. Ringo Radio operating in Yamamoto Town Hall (from Shinjuku Daily Photo 2011)

For the first week of the crisis, communities devastated by the disaster consistently cited radio as the most useful source of information.[192] One factor was the Japanese government's system, previously in place, to grant temporary emergency radio broadcasting licenses; 21 new disaster radio stations were established within a month of the earthquake.[193]

Radio transmission became such an important channel that the federal government distributed 10,000 portable radios to evacuation centers and asked radio manufacturers—including Panasonic and Sony—to contribute another

191 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

192 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

193 Ibid.

40,000+ radios.[194] Car radios and battery-powered radios proved useful during the widespread power outages.[195]

Use of radio presented its own challenges. Some local government radio channels were not available because of power outages and failure of backup systems. Another challenge to radio broadcasting was personnel. Immediately following the disaster, volunteer resources were abundant, but that number decreased over time, even though the help was still needed. A World Bank analysis concluded that a "substantial funding source" is needed to ensure radio broadcasting following a disaster.[196]

Local community radio, having proved to be so valuable following the GEJE disaster, suffered financially. Some stations—including H@! FM and Radio Ishinomaki—lost significant revenue because they decided to not air commercial messages for weeks on end.[197]

**Area Number 3: Collapse of communications infrastructure.** To overcome the lack of infrastructure, some people got inventive and went back to basics.

When newspaper publishers faced damaged presses and power outages, some figured out a way to deliver the news in a new way. For example, *Hibi Shimbun*—the daily paper in Ishinomaki, Miyagi—sent its reporters out to collect information. Beginning the day after GEJE, the reporters produced handwritten

194 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

195 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

196 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

197 Ibid.

newsletters (Figure 12), which they posted to walls of evacuation centers.[198] After six days, the newspaper located a working computer printer and produced 700 copies of the newsletter.[199]

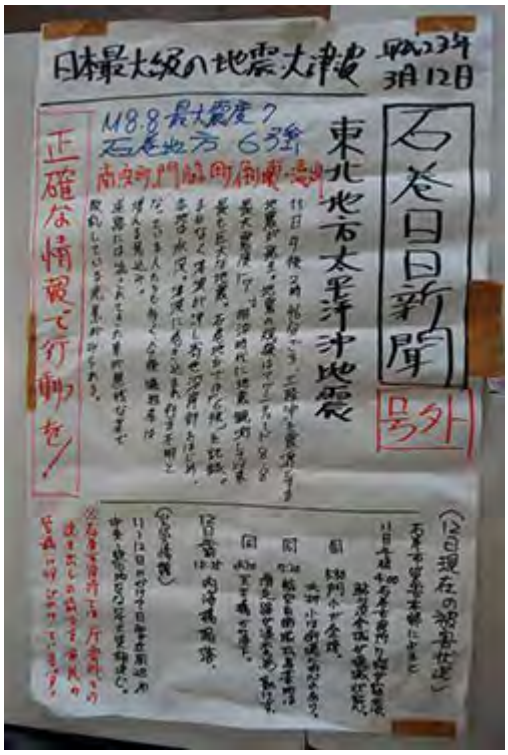


Figure 12. Sample of the handwritten *Ishinomaki Hibi Shimbun* (from Consulate-General of Japan in Atlanta, 2011)

Newsletters also proved an extremely useful method of getting information to those living in temporary shelters and evacuation centers. For example, CARE International supported several newsletter projects to connect friends and family who were separated and living in different evacuation centers.[200]

198 Consulate-General of Japan in Atlanta, "Handwritten Newspapers Published by Ishinomaki Hibi Shimbun," Consulate-General of Japan in Atlanta, http://www.atlanta.us.emb-japan.go.jp/hts2.html.

199 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

200 Ibid.

**Nimbleness:** Which channels worked best in various situations? For the most part, the means of communication varied from locality to locality, and changed as the disaster unfolded. The shifting nature of the disaster meant that, to be effective, people working in recovery efforts needed to be nimble, flexible, and sometimes innovative.

For example, when newspapers were not able to produce printed papers, they were able to get information out online and via social media. Many increased their Twitter followers by tens of thousands.[201] Other newspapers posted printed copies and some even posted handwritten newsletters.

## C. COMMUNICATIONS FAILURES

Despite all the successes, the Japanese people struggled with numerous communications issues in the days, weeks and months following the GEJE disaster. One of the more problematic issues was the digital divide. Many residents in those communities that were most affected by the earthquake and tsunami were demographically older. And these older residents had less access to, or familiarity with, digital information options.[202] Those with digital options had many more opportunities to access needed information, thus differentiating the "haves" and the "have-nots."

Public address systems worked well in some towns, but many were disabled by the earthquake or by power outage. This hindered tsunami warnings; many people died who did not receive later, updated warnings of the much higher tsunami estimates.[203] Japan does have a robust system of public notifications, and indeed, the automatic earthquake warnings interrupted broadcast programming a few minutes before the earthquake hit. For the first few days, Japan's major TV networks devoted more than 90 percent of their programming to the disaster.

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201 Ibid.

202 Ibid.

203 Ibid.

## D. SUMMARY

An analysis of Japan's triple disaster in the context of the "high-tech, low-tech, and no-tech" conceptual framework revealed communications successes for each of the three core communications issues.

In the first area of fragile communications channels, a variety of high-tech solutions enabled people to keep in touch with other; social media tools were particularly useful. In the second area of Mismatched information, low-tech methods filled an important gap; local community radio was particularly helpful. In the third area of communications infrastructure collapse, people got inventive, and used old-school techniques to get the job done.

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# VII. ANALYSIS AND DISCUSSION

> *All systems, all vestiges of modern living — communications, power, water — all are down. There is no way to communicate with the people.*
>
> Philippine Interior Secretary Mar Roxas,
> following Typhoon Haiyan, 2013[204]

This thesis project focused on answering the research question, looking for communications strategies to help emergency managers communicate important life/safety information with the public during major power outages. The project took place from the perspective of a researcher who has worked in the field of public relations, public affairs and communications for nearly 30 years, in private, public, and non-profit sectors. As Director of Communications for Arlington, Virginia, the researcher is responsible for countywide communications, including during emergencies.

This research question came about because of frustrations experienced in trying to communicate information to constituents during major incidents that involve significant power outages. The anxiety level goes up even higher when the temperatures are extreme and the community needs critical life/safety information.

## A. EXAMINING THREE CORE COMMUNICATIONS ISSUES

The project looked at examined three diverse crises to look for ways that those communities handled the three core communications issues identified at the outset: fragile communications channels, Mismatched information, and collapse of communications infrastructure.

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204 Typhoon Haiyan hit the coast of the Philippines, November 8, 2013, killing thousands, Associated Press, "With Thousands Dead, Philippine Typhoon 'a Great Human Tragedy'," *The Washington Post*, sec. A, Nov. 10, 2013b, http://www.washingtonpost.com/world/asia_pacific/philippine-authorities-expect-very-high-number-of-deaths-after-typhoon-slams-central-region/2013/11/09/573a24be-499e-11e3-b87a-e66bd9ff3537_story.html.

Of the three cases, the 2003 Northeast Blackout was the least traumatic. Although it left 56 million people in the dark across eight U.S. states and two Canadian provinces, the duration of the blackout was much shorter than the other two cases. While people were greatly inconvenienced, the situation resolved itself fairly quickly when the power came back on, for the most part, in four days.

The research validated the common-sense notion that, the longer the blackout, the worse the communications problems.

A number of practical solutions emerged, across the cases, which have successfully addressed the three core communications areas. These solutions can help emergency managers now, as well as inform future research. A comparison of the three cases is described in this chapter and summarized in Appendix C.

## B. HIGH-TECH: DISCUSSION AND HURDLES

For the core communications issue of fragile communications channels, the research showed that high-tech solutions have been successfully used.

Telecommunication in the United States includes a large number of mobile technologies, including mobile phones, smart phones, tablets, and other mobile devices. And this usage is growing. At the end of 2012, Americans had more mobile devices than people; the U.S. had 326.4 million mobile devices,[205] and a population of 315.1 million.[206] This study examined how emergency managers can leverage these popular devices to help them communicate with the public during power outages.

205 CTIA, “Wireless Quick Facts: Year-End Figures,” CTIA The Wireless Association, http://www.ctia.org/advocacy/research/index.cfm/aid/10323.

206 United States Census, “U.S. and World Population Clock,” U.S. Department of Commerce, http://www.census.gov/popclock/.

All three cases had high-tech elements that were successful. It makes sense that the most recent case (Japan's 2011 GEJE) had the advantage of the most modern high-tech tools. Indeed, it turned out to be the case that Japan had more high-tech options, as well as successes. For Japan's GEJE, the plethora of smart phones and use of social media produced many successes.

Social media assisted with search and rescue efforts, helping to save lives. These networks also helped people find each other and helped get volunteers and relief efforts where they were needed. Because of these experiences, local Japanese governments in GEJE-affected areas now consider social networks a valuable tool in disasters.

As the most recent case, the Japanese GEJE also showed the usefulness of smart phones, which were more widely used in 2011. These phones were able to access the Internet and social media tools during the disaster, making those platforms available to more people.

The earlier cases (2003 Northeast Blackout and 2005 Hurricane Katrina) also had high-tech successes. In both cases, text messaging proved useful, as text messaging can more easily get through crowded mobile networks. These two earlier cases did not have social media successes, as these channels were not yet widely available.

In all three cases, private efforts proved to be extremely valuable. From private instant-messaging services to setting up mobile and Internet networks to Google's People Finder, private entities found ways to leverage their own technologies and expertise to benefit the disaster-stricken communities. As early as 2005, for the Katrina response, Yahoo!'s metasearch engine helped find missing persons and reunite families.

Private entities helped with hardware, as well. Dell and other technology companies donated hundreds of computers to volunteer centers.

**Hurdles:** Full use of social media for emergency purposes in the U.S. faces a number of hurdles. Many officials resist the adoption of social media tools as legitimate communications channels. Some resist because these channels cannot be controlled; some because their agency has determined that unwieldy public records must be kept; some resist because they are "too busy" to take on another responsibility.

Simple unfamiliarity may be the biggest hurdle of all**.** At present, it is easy for emergency managers to dismiss Twitter, as many U.S. homeland security leaders are unfamiliar with this brave new digital world. For example, Professor Rodrigo Nieto-Gomez, of Naval Postgraduate School's Center for Homeland Defense and Security, one of the nation's preeminent educators of homeland security leaders, posted to his Twitter feed on April 20, 2013, "Will 1201/1202 be the first cohort ever where no one joins twitter?!"


Figure 13. Center for Homeland Defense and Security's Professor Rodrigo Nieto-Gomez Tweeted his concerns about students' lack of interest in Twitter (from Twitter 2013)

In the response to Japan's GEJE, social media were very helpful but also created some headaches. Some Twitter posts, for example, continued to be re-tweeted after the victims had been rescued, thus potentially diverting valuable rescue efforts. Disaster hash tags were also flooded with irrelevant information, creating a number of distracting posts.

Successes in social media also resulted in some inequities. Older residents had less familiarity with, and access to, digital information options. Thus, social media resulted in the unintended consequence of creating the information "haves" and "have-nots."

Other hurdles in the high-tech arena include resources; some of the high-tech solutions require funds and all efforts require staff attention. Some may be eligible for grant funding, e.g., emergency alert systems, but others will have to compete for dwindling resources and multiple priorities. Another hurdle is simply the technology itself; for example, some outdoor warning systems operate by line-of-sight and are stymied by tall buildings.

## C. LOW-TECH: DISCUSSION AND HURDLES

For the core communications area of Mismatched information, across all three cases, community radio was a real success story. These stations broadcast the hyper-local information that people needed, e.g., where to get water and shelter, and filled a very important gap. While network broadcast stations are engaged in wall-to-wall disaster coverage, they cannot focus attention on the hyper-local information needed on the neighborhood level.

Community radio could be received by anyone with a radio, making this channel easily accessible. Radios are inexpensive and can be powered by batteries, solar, or hand-cranking. People also listened to car radios. After conditions improved, hyper-local community radio continued to broadcast, serving as a source of comfort and support to residents.

Private efforts proved to be invaluable. In the Japan case, Panasonic, Sony and other manufacturers donated tens of thousands of battery-powered radios.

Amateur “Ham” radio proved to be extremely valuable to emergency managers during the U.S. crises, by helping with communications between responders. By providing point-to-point communication, they played a valuable role in emergency management.

**Hurdles:** The primary hurdle for community radio is finding an entity willing to create and run a hyper-local community radio station, if one does not already exist. Stations would have to be established ahead of a disaster and

apply for required FCC (Federal Communications Commission) licenses. Japanese regulations allow for speedy granting of temporary emergency radio broadcasting licenses, while FCC licensing windows open periodically for its hyper-local program, Low Power FM Broadcast Radio Stations.[207]

A related hurdle is ensuring that community radio stations have sufficient funding to operate during disasters. A World Bank analysis concludes that a "substantial funding source" is needed to ensure radio broadcasting following a disaster.[208] In a worst-case scenario, local government could stand up a radio-in-a-box station after a disaster has occurred.

Working with Ham radio operators does not present many hurdles; the Hams are accustomed to and regularly participate in drills and exercises, often in partnership with local responders. Hams do not broadcast to the public at large, and so are not able to assist with mass (public) communications, but they can be extremely helpful to first responders and point-to-point communications.

## D. NO-TECH: DISCUSSION AND HURDLES

For the core communications area of infrastructure collapse, all three cases showed that, when all else fails, emergency managers could go back to basics. From handwritten posters to printed flyers to a bullhorn to just plain walking around and talking to people—emergency managers figured out what would work.

Across the cases, posters and flyers were most useful when placed in popular gathering places. Here, too, private efforts were invaluable. In Japan, newspaper reporters and editors made heroic efforts to collect and distribute information.

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207 Federal Communications Commission, "Low Power FM Broadcast Radio Stations (LPFM)," Federal Communications Commission, http://www.fcc.gov/encyclopedia/low-power-fm-broadcast-radio-stations-lpfm#WINDOWS.

208 Rajib Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication World Bank [2012]).

And as responders learned after Hurricane Katrina, using messengers proved a workable method of getting information from Point A to Point B. This method was successfully used in New Orleans, as it was during the Revolutionary War.

**Hurdles:** The main hurdle is probably that no one wants to believe that a total catastrophe is likely to happen in our community. The Japanese no doubt never dreamed that an earthquake-tsunami-nuclear disaster would cripple a huge part of their country, devastating infrastructure and leaving thousands in the dark for months. The people of Grand Forks, North Dakota never thought they would totally lose their downtown and most of their infrastructure.

If a town's strategy is to prepare for the most likely events, it will not prepare for the "black swan" catastrophe—the high consequence, low probability event. The preparations, however, for the 'no-tech" plan are modest and can easily be accomplished through existing resources, making this an affordable insurance policy.

## E. COMMUNICATIONS FAILURES

There were common failures across the cases. Across all cases, what stopped working was basic communications infrastructure, including landline telephones, mobile phones, and even 911 services. It was clear that any entity that relied solely on "normal" communications methods was in trouble.

Communications problems were mildest in the 2003 Blackout, principally due to the relatively short duration of the crisis. For the other two cases, however, lack of communications compounded other problems and thus became one of the most critical issues of the disaster.

Across all cases, television media were not available or were severely disrupted. Under normal circumstances, this is a primary communications channel through which local governments can communicate with the public.

However, the three cases show that this channel cannot be relied upon in the direst circumstances. In two of the cases, print media were not available or were severely disrupted.

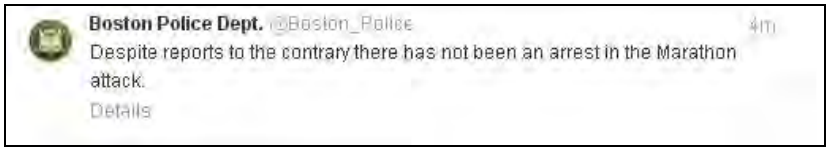


Figure 14. Boston PD used Twitter to address misinformation following the Boston Marathon bombings (from Twitter 2013)

In two of the cases, misinformation was also a problem for responders. Social media can help address misinformation, as it did with the April 2013 bombings at the Boston Marathon. On April 17, 2013, widespread media reports, including Associated Press, announced that a suspect was in custody. With one Twitter post, the Boston Police Department was able to set the record straight (Figure 14).[209]

## F. OVERALL HURDLES

Implementation of these "high-tech, low-tech, no-tech" solutions faces a number of general hurdles. One of the larger challenges may simply be time and resources. In recent years, all local governments have suffered ever-decreasing budgets, and staffs have had to assume more and more responsibilities. Consequently, local government staff people are very busy and no one needs "extra" work, and these efforts may be perceived as extra, unnecessary work.

While many of the recommendations in this implementation plan are low-cost or free, they still require time and attention to make them a reality. See Appendix D for a recommended implementation plan and Appendix E for rough cost estimates.

209 Associated Press, "Update: Feds Deny Reports of Boston Suspect in Custody," MagicValley.com, http://magicvalley.com/news/local/update-feds-deny-reports-of-boston-suspect-in-custody/article_e2f405f2-a786-11e2-9814-0019bb2963f4.html.

# VIII. FINDINGS

*There is no fail-safe system.*[210]

In any disaster, communications are important. In the direst scenarios, when communications are more important than ever, damage to communications networks removes most normal communications channels.

## A. "HIGH-TECH, LOW-TECH, NO-TECH": A THREE-PRONGED APPROACH

The research shows that lack of communications is a critically important aspect of emergency management, response and recovery. Figuring out how to communicate with the public during crises is a goal worth pursuing, one for which it is worth investing and preparing.

No one communications method can be guaranteed to work 100 percent of the time, throughout every disaster. Infrastructure has been and can be destroyed. Power outages can last days, weeks, or even months. It may not even be physically possible to drive a car on a street and broadcast information with a bullhorn. The point is: no single solution is the answer. A serious power outage can disable communications infrastructure. Severe weather can wipe out a town.

To address a range of disasters, the "high-tech, low-tech, no-tech" approach would be a wise choice, one that boosts the chances of being able to communicate important information to the public. As discussed in Chapter VII, a blend of high-tech, low-tech, and no-tech can be a winning combination. If one category is not working, another may be available. This three-pronged approach addresses the three core communications issues identified and provides emergency managers with a needed plan.

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210 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

**Beware the "techno-fix":** In looking at disaster-related communications problems, it is natural to look for technical or infrastructure solutions. The review of the literature found many efforts focused on technical solutions. Two examples are COW (Cell on Wheels), which provides emergency mobile phone service, and Radio-in-a-Box, which is a self-contained unit with everything needed to stand up a local radio station.

These are valuable, worthwhile efforts, but this research focused on how emergency managers can communicate now; not every community will be able to purchase robust technical solutions. Perhaps, with technological innovations, someday this research will be totally moot. That would be an excellent outcome. In the meantime, emergency managers must be prepared to communicate vital life-safety information to the public during a catastrophic disaster.

And many observers caution that such "techno-fixes" can only go so far. Total failure of communications technology, as seen in Japan's GEJE and Hurricane Katrina, showcased the vulnerabilities of an overreliance on technical solutions. In writing about crisis communications, Garnett and Kouzmin warned of the tendency to seek answers in the next technical solution, which they termed the "techno-fix."[211] No doubt some of these will be successful, but emergency managers cannot count solely on a techno-fix; they must be prepared to communicate with the community, particularly when disaster strikes.

## B. HIGH-TECH: ADDRESSING FRAGILE COMMUNICATIONS CHANNELS

Emergency managers can leverage the high usage of mobile devices and exploit it for emergency communications purposes. For example, with more than 500 million users, Twitter has become a leading source of information. Assuming emergency managers have access to backup generators, they can send out messages via social media channels. And people with access to powered devices would be able to receive the information. Local governments in the

211 Garnett and Kouzmin, Communicating Throughout Katrina: Competing and Complementary Conceptual Lenses on Crisis Communication, 171–188.

disaster-affected areas of Japan's triple disaster now consider social networks to be a valuable communications tool in disasters.[212]

Smart phones enable use of social media. In the U.S., social media usage (61% of population) is much higher than it is in Japan (35%).[213] Even with that lower participating percentage, social media proved to be very useful during Japan's triple disaster.

Clearly, smart phones have proven to be enormously useful during crises. To address affordability, some mobile phone companies have introduced inexpensive smart phones that could make them more affordable in the future. For example, the Chinese company Huawei announced it is selling a USD $80 smart phone.[214]

Emergency managers and communicators must go to where the people are, to get important messages across. To talk with soccer parents, it would be wise to walk over to the local soccer field; it would not be terribly effective to sit at a desk and shout toward the window. Similarly, today, to reach people in the community, it would be wise to go to where they are. And where they are today is on social media.

On August 13, 2013, the National Capital Region's Public Information Officers (PIOs) held their second annual Social Media in Emergency Management (#NCRsmem) Summit. The 150 PIOs in attendance agreed that social media are essential communications tools before, during and after disasters. They also agreed that these tools are essential for day-to-day needs, to establish them as trusted sources.

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212 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

213 Ed Carrasco, "Which Country Uses Social Media the most? (Infographic)," NMR - New Media Rockstars, http://newmediarockstars.com/2012/03/global-social-media-use/.

214 Lance Harris, "Kenyan Operator Safaricom to Phase Out Feature Phones, Focus on Smartphones," ZDNet, http://www.zdnet.com/kenyan-operator-safaricom-to-phase-out-feature-phones-focus-on-smartphones-7000011944/.

In September, 2013, Twitter announced "Twitter Alerts," a new feature to help people get important information during emergencies when "other communications services aren't accessible." The service will validate trusted sources, such as government agencies and first responders, for the "Twitter Alert" designation. FEMA (Federal Emergency Management Agency) Administrator Craig Fugate endorsed this feature, saying, "Social media has revolutionized communication during disasters."[215]

The move toward social media is inevitable; the only question is how soon. In the not-too-distant future, a new generation of homeland security leaders, who will be digital natives, will certainly push homeland security strategies into the digital age. The establishment of a trusted social media channel (e.g., Twitter) long *before* an emergency is essential to its success when the emergency strikes.

And even absent social media, text messages sent via mobile phones or smart phones have a much higher probability of getting through during crises, as they require much smaller capacity than voice traffic.[216]

These high-tech methods still require a mobile device to be able to be recharged. During emergencies, many communities enable recharging of devices at public facilities. As long as gasoline supplies are available, people can also recharge devices through their car's electrical system.

## C. LOW-TECH: ADDRESSING MISMATCHED INFORMATION

It was clear across the three cases that, whatever the situation—cause of the disaster, country, culture, and weather—what people needed most was extremely localized information. They needed to know where they could go for

215 Bridget Coyne, "Introducing Twitter Alerts," Twitter.com, https://blog.twitter.com/2013/introducing-twitter-alerts.

216 Steve Dance, "Communications Lessons from the Boston Marathon Bombing," Continuity Central: the international business continuity information portal, http://www.continuitycentral.com/feature1068.html.

shelter; where they could get relief supplies, including food and water; how they could find family and friends.

Though hyper-local information was important in all three cases, it was more crucial in the more severe cases (i.e., Katrina and Japan's GEJE). It makes sense that, the more dire the circumstances, the greater the need for practical information needed to live day-to-day.

For a number of years now, Department of Homeland Security, FEMA, and state and local governments have been urging citizens to make emergency preparedness plans for themselves and their families. Despite these efforts, the level of preparedness is not as high as it should be. A 2012 national survey from Adelphi University Center for Health Innovation found that nearly half of adults do not have emergency supplies. And the findings suggest that Americans have a false sense of security; though more than 53 percent do not have a three-day supply of food and water, they believe they can survive in their homes for an average of 16 days.[217]

These results suggest that many Americans are not prepared to take care of themselves for an extended disaster, and in a crisis, will require government and community assistance. Governments must figure out how they can communicate this vital information to the public in the direst circumstances.

Across the cases, hyper-local community radio stations were among the top sources of extremely local information that people needed most. In addition, as conditions improved, hyper-local radio transitioned to sources of support and comfort, thus serving as vital lifelines to connect communities. In this way, local radio provided an intangible community benefit, in addition to its more obvious practical purposes.

217 Mary Elizabeth Dallas, "Many Americans Not Prepared for Disasters: Poll," Health Day, http://consumer.healthday.com/mental-health-information-25/behavior-health-news-56/many-americans-not-prepared-for-disasters-poll-666756.html.

Although hyper-local radio is extremely valuable during crises, in our modern day-to-day world, it is seen as hopelessly boring and old-fashioned. Local radio stations can have resource challenges, including finances and volunteers. Local communities would be wise to invest in local radio partnerships to ensure they are functioning during disasters. The World Bank has made a recommendation for such a funding source for local radio, for exactly this reason.[218]

Amateur “Ham” radio proved very valuable in the U.S. cases (Northeast Blackout and Katrina). As their primary function is point-to-point, they are very helpful to help communicate between responders; however, they do not broadcast to a mass audience and therefore, have not been emphasized here.

## D. NO-TECH: ADDRESSING COLLAPSE OF COMMUNICATIONS INFRASTRUCTURE

When all else fails, local governments must be prepared to go backward and use old-fashioned methods to reach people with information. In all three cases, people used their ingenuity to figure out ways to get information to the people who needed it. The focus should be on getting information to the places where people naturally gather following disasters, e.g., corner stores, evacuation centers, gas stations.

## E. FLEXIBILITY REQUIRED

Different disasters, different communities, and different audiences will call for using different tools.

In times of emergency, emergency managers will need to be flexible, nimble, and inventive; they must be prepared to adapt quickly and use whatever communication method is working and available. Local governments would be prudent to establish policies that enable a wide variety of communications tools to be quickly put into place.

218 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

An inventory would help to determine if governments have access to a wide variety of high-tech, low-tech, and no-tech solutions. For example, does the local jurisdiction have at least two photocopiers with access to emergency generator power and protection from flooding problems? And does it have good relationships with the next community over, in case its infrastructure is totally wiped out? (See Appendix D for a more detailed list of questions and suggested implementation plan).

In his book, *Disrupted Cities: When Infrastructure Fails*, author Stephen Graham suggested that improvisation is an essential skill for emergency managers and first responders. He recommended emergency response exercises in which infrastructure is not available, so responders can learn how to develop workarounds.[219]

Above all, the "high-tech, low-tech, no-tech" approach requires agility—the ability to quickly move to a different solution. This could prove problematic. For example, the U.S. Congressional report on the Hurricane Katrina response concluded that all levels of government lack "flexibility and adaptability," which often delay the response.[220]

## F. PRIVATE EFFORTS

The public sector shouldered an enormous load in each of the three cases, but the private sector and the non-profit sector made invaluable contributions and are essential to emergency response. Private companies donated tangible goods, including computers, batteries, radios and flashlights, as well as services, expertise, and volunteers.

219 Graham, *Disrupted Cities: When Infrastructure Fails*.

220 Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, *Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina*.

In many cases, private and non-profit entities saw a need and jumped in to fill it, including building ways in which displaced persons could find each other, and building crowdsourcing tools to aid the emergency response.

Google, for example, is looking at way to assist elderly persons in future emergencies. One idea is to use evacuation centers as information hubs, providing computers and assistance to those who need the help.[221]

These efforts are priceless and we must encourage, embrace, and nurture them.

## G. ADDRESSING A GAP IN THE LITERATURE

Why is so difficult to find emergency operations plans that include planning for communicating during scenarios that include catastrophic loss of power? The answer is not clear. Perhaps emergency managers are planning for the more likely scenarios, not the direst ones. Emergency managers may also be betting on a "techno-fix."

Many after-action reports focused on communications between responders, or between agencies, or between political entities and the media. It is curious, but many reports acknowledged the importance of communicating with the public, but did not specify any ideas on how this might be accomplished. This research addressed this gap.

## H. PREPARING FOR THE WORST

These days, everyone is very busy and no one needs "extra" work. But the consequences of being unable to deliver critical life/safety information to our communities can be devastating. By preparing for the worst, emergency managers can be as prepared as possible to weather the next disaster.

How long will it take to implement this plan? Many items could be implemented very quickly, and others have a longer-term horizon. For example, it

221 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

takes mere minutes to establish a Twitter or Facebook account, yet establishing a culture and practice of continuous two-way outreach is a longer-term proposition for a locality.

Many communities already have established excellent relations with its hyper-local radio station and its Ham operators; others may need to take the time to nurture those relationships. The purchasing of bigger-ticket items, such as emergency alert system or outdoor warning system, is a strategic decision that must be handled as a priority budget request or grant application.

What does success look like? Emergency managers will be successful if, during the next devastating power outage, they are able to communicate critical life-safety information to the people who need it most. Success could mean the difference between life and death for people shaken by a devastating disaster.

Having prepared for the worst, emergency managers can be ready to use a variety of tools, and increase chances of success in our communities.

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# IX. CONCLUSION AND RECOMMENDATIONS

*The Great East Japan Earthquake also corroborates evidence drawn from other major disasters: that information saves lives, that communication itself is a form of aid.*[222]

This research project has shown that it is possible for localities to prepare for the worst—to be able to communicate critical life-safety information to the public during a major power outage, even when communications infrastructure has collapsed.

The researcher discovered a gap in the literature. The literature is clear that communicating with the public during a crisis is a vital part of emergency response and recovery. Yet specific recommendations on how communities and emergency managers can go about accomplishing this important task are few and far between.

The research project bridged that gap, through a conceptual framework of "high-tech, low-tech, and no-tech" solutions to address three core communications areas: fragile communications channels, Mismatched information, and collapse of infrastructure. By examining three major disasters, the research confirmed that emergency managers could use the three-pronged "high-low-no-tech" plan to communicate with their publics. This "high-low-no-tech" plan comprises methods and technologies that currently exist, have worked successfully in the past, and are affordable.

What is new about this proposal? None of these methods is revolutionary; all are well known, well used and exist in virtually every community in America. All have been proven to work effectively in recent major disasters.

222 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

What is new is the proposal that emergency managers in local jurisdictions proactively prepare for the worst scenarios, by making preparations for communicating with their public, via the “high-tech, low-tech, no-tech” combination. Key elements for success include:

- Focusing on the hyper-local information that people need
- Flexibility to quickly adapt and use those tools and channels that are up and working
- Nurturing and encouraging private efforts to help in response and relief efforts
- Preparing for the worst
- Not relying on a “techno-fix”

People are inventive and can come up ingenious solutions (see Figure 15). Often, government policies do not leave much room for imagination or deviation from the authorized plan or policy. When the crisis is extreme, governments must be flexible enough and nimble enough to use whatever will work, even if it does not fit the official policy.

Figure 15. Ryan Nelsen (right) and Fields Harrington (second from right) pedaled a tandem bicycle to generate power as people wait for their cell phones to recharge on Avenue C in the East Village of Manhattan, in New York. Following Hurricane Sandy, this neighborhood had no electrical power (from Stan Honda, Getty Images, November 1, 2012, *Chicago Tribune*)

**Continuity of Operations:** These recommendations dovetail well into FEMA's Continuity of Operations Plan (COOP) Templates, which urge "communications systems needed to ensure connectivity during crisis and disaster conditions."[223] Local emergency managers should consider implementing the "high-low-no-tech" approach to fulfill the communications needs of their Continuity of Operations Plans, thus ensuring the availability of communications with the public in all conditions.

To take this a step farther, FEMA should consider incorporating the "high-low-no-tech" approach into the COOP template, which currently assumes that communications systems—phones, Internet, email, two-way radios—will be operational within 12 hours of activation. As this study has shown, this assumption is not always possible.

## A. IMPLEMENTING "HIGH-TECH, LOW-TECH, NO-TECH" APPROACH

How could localities go about implementing this three-pronged approach? Appendix D described a plan crafted for one community ("the City") to enable a wide variety of communications tools to be quickly put into place. The plan can easily be replicated in other communities, or scaled up or down, depending on particular community needs.

Embracing use of the different tools recommended here will require understanding, agreement, commitment and buy-in from senior management. For example, many observers have hailed Boston Police Department's successful use of Twitter in the aftermath of the April 2013 Boston Marathon bombings. The success in large part is due to commitment from that department's leadership. Deputy Commissioner John Daley (Twitter handle:

223 Federal Emergency Management Agency (FEMA), Continuity Plan Template for Non-Federal Entities (Washington, D.C.: U.S. Department of Homeland Security [2011]).

@deputydaley) Tweets from his own account as well as from the department's account (@Boston_Police). Thanks to Twitter, Boston Police was able quickly to squash erroneous rumors.[224]

Appendix E described rough cost estimates for the implementation plan.

Those in rural areas may find these recommendations are more appropriate for urban areas. However, rural areas should find at least some of these findings and recommendations to be useful in preparing for the worst.

## B. LIMITATIONS

*The only constant is change.*

Heraclitus of Ephesus (c.535-475 B.C.)

This research project was limited to open-source, published writings, including reports, journal articles, and media stories. While it represents a robust search of open sources, it does not capture every possible method, solution, or idea. The design of this research included a number of limitations.

- **Limited information.** The project was limited to the review of three chosen cases. While the attempt was made to choose diverse cases, the information and scope were limited to the finite data reviewed. The study did not include any blackout crises caused by nefarious means, i.e., terrorism. The research was also limited to unclassified information that was reported in various written forms.
- **Focused on developed society.** All information in the study came from experiences in the developed world. While there may be some successful tactics in undeveloped societies, these were not studied.
- **No new innovations.** This study is limited to communications channels that are currently widely available to emergency managers; it did not include looking for new innovations or technologies. It was biased toward communications tools and channels that are widely used and relatively inexpensive. The study did not include any efforts to harden the power grid or communications infrastructure, such as COW (Cell on Wheels), a

224 Greg Licamele, "Government as Evocative and Provocative Publishers," The Digital PIO, http://digitalpio.wordpress.com/category/smem/.

mobile cellular phone site. While these are worthwhile efforts, they were not studied in this project.

- **Ignores communications between responders.** This study focused on emergency managers' ability to communicate with the public and, with few exceptions, ignored any issues that first responders have in communicating amongst themselves. Also, with a few exceptions, the study ignored the public's ability to communicate with responders, emergency managers, and each other.
- **Ignores jurisdictional authority.** The study did not address which agency, governing body, or emergency management agency has the authority or operational command for incident management and communications.
- **No funding consideration.** The study did not take into consideration any budgetary constraints or needs, though the emphasis within the study was on channels that were free or of relatively low cost.
- **Ignores ownership.** The study did not take into consideration what entity owns any particular tool or channel, including electric or telephone companies. It also was agnostic toward assets owned by public or private entities.
- **No consideration of skills.** The study did not consider any special skills that might be needed for emergency managers to implement the recommendations.
- **Short shelf life.** Technical innovations come about quickly; new, inexpensive solutions will become available and this research will quickly become outdated.

Despite these limitations, this research project filled an important research gap and gives emergency managers a number of free or low-cost options to use during major blackouts.

## C. AREAS FOR FUTURE RESEARCH

This research will quickly become outdated. At the time of Hurricane Katrina (2005), MySpace was the most popular social media tool, Facebook was limited to college campuses, and Twitter had not been invented. At the time of this publication just eight years later, MySpace now occupies a niche in music and entertainment, shares in Facebook and Twitter are publicly-traded and many

people who work in emergency management are calling Twitter the top crisis communications tool. Technology evolves rapidly.

In no time, the next big communications tool will be here and the tools described here will be laughably outdated. Future researchers will be able to analyze new technologies and tools as they become available, and make recommendations to new generations of responders.

What is not likely to change quickly is society's dependence on electricity and the fragility of the power grid. What is not likely to change quickly is the need for "high-tech, low-tech, and no-tech" methods, so that emergency managers can reach the public with important information. What is not likely to change quickly is the need for responders to be nimble, and to be prepared to use whatever tools are up and working when faced with a disaster.

In future years, no doubt new technologies and solutions will be available. On June 14, 2013, Google announced that it launched 30 giant helium balloons into the air over New Zealand. Circling 12 miles above Earth, the balloons were equipped to send wireless Internet signals below, providing free access to rural areas.[225]

It is hoped that, in the future, such technology may be able to provide Internet service when an area has lost communications. While some technologies are promising, emergency managers and localities still must be ready for today's scenarios, with today's solutions.

225 Cecilia Kang, "Google to use Balloons to Provide Free Internet Access to Remote Or Poor Areas," *The Washington Post* (June 14, 2013), http://www.washingtonpost.com/business/technology/google-to-use-balloons-to-provide-Internet-access-to-remote-areas/2013/06/14/f9d78196-d507-11e2-a73e-826d299ff459_story.html.

# APPENDIX A. DEFINITIONS

Terms integral to, and appearing throughout, this thesis are defined here.

**Power outage** and **blackout** are used interchangeably for the disruption of electric power to a community; the focus was on major disruptions.

**Emergency manager** referred to state and local government emergency managers and responders who are responsible for managing crises. The project used the context of the Incident Command System (ICS), which includes a core component of public information.

**Public communication** and **life/safety information** referred to important life/safety information that community members need to remain healthy and keep their families safe. This included, for example, information on where the toxic plume is headed, where they can get untainted food and water, where they can go for shelter. This is information that, under ICS, emergency managers must convey to the community, as well as the various channels/methods used to push out the information. This study did not look at communications among first responders, or between members of the community.

**Availability** referred to communications channels that currently exist, that are free or of relatively low cost.

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# APPENDIX B. RESEARCH QUESTIONS

Additional research questions helped to answer the overall research question:

*What high-tech, low-tech, and no-tech communication strategies can support public communications during large-scale power outages?*

| Research question | How question helped to answer overall research question | How question led to analysis, findings, and conclusion |
|---|---|---|
| 1. What happened? What is the basic description of the incident? | All cases involved a large-scale power outage across a wide swath of the community, for an extended period of time; in two cases, this was a period of some months. | The "high-low-no-tech" approach should be incorporated into COOP plans and into FEMA's COOP templates.[226] |
| 2. How were communications impacted? Were any channels open / available? | Failure of normal communications channels greatly impacted all cases, worsening the crises. In each case, successful outcomes arose in high-tech, low-tech, and no-tech solutions. | Emergency managers must be prepared for the direst situations, even the less likely ones. |
| 3. How did the public receive important information during the crisis? | Normal channels were inoperable; successes covered the gamut from high-tech, low-tech, and no-tech solutions. | Free or low-cost solutions proved workable. Low-tech community radio was valuable across the cases to share hyper-local information. No-tech flyers helped in the direst situations. |
| 4. What went well? What factors were present that affected the outcome in a positive way? | The more recent cases showed the value of smart phones and social media. Private efforts were extremely valuable across the cases. | Successes required emergency managers to be creative and flexible. The longer the blackout, the worse the communications problems. |
| 5. What went poorly? What factors were present that affected the outcome in a negative way? | Traditional media and communications methods cannot be relied on. People still needed to be able to recharge mobile devices. | Misinformation was a problem; in some instances, social media and community radio helped correct misinformation. |

226 COOP = Continuity of Operations; FEMA = Federal Emergency Management Agency.

| Research question | How question helped to answer overall research question | How question led to analysis, findings, and conclusion |
|---|---|---|
| 6. What are the lessons learned? Any good ideas / solutions that emerged? Did people make use of "old-school" methods and, if so, how were they used? Did people make use of new technologies and, if so, how were they used? | The cases revealed that people creatively used the gamut of high-tech, low-tech, and no-tech methods. The researcher had anticipated high-tech and no-tech solutions, but the discovery of low-tech methods was a pleasant surprise. | Emergency managers must prepare for the direst circumstances and not rely solely on a "techno-fix." What is new is the recommendation that emergency managers be prepared for the direst circumstances, with a range of communications options. |
| 7. What is the relationship between people's level of technical dependence and their resilience during severe power outages? | Those with less access to Internet, mobile devices (particularly elderly residents) were disadvantaged; low-tech and no-tech solutions were needed to reach them. | Future technologies may solve these problems; in the meantime, emergency managers must be prepared for today's challenges. |

Table 1. Additional research questions helped to answer the overall research question

# APPENDIX C. HIGH-LOW-NO-TECH SOLUTIONS

An at-a-glance comparison of how “high-low-no-tech” solutions helped to address the three identified problem areas.

| | Fragile comms channels | Mismatched information | Infrastructure collapse |
|---|---|---|---|
| | | | |
| **High-tech** | x | | |
| Text messaging | x | | |
| Social media | x | x | x |
| Internet tools | x | | |
| Private efforts | x | | |
| Alert systems | x | x | |
| Smart phones | x | | x |
| | | | |
| **Low-tech** | | | |
| Local radio | | x | |
| Amateur “Ham” radio | | x | |
| Print media | | x | |
| | | | |
| **No-tech** | | | |
| Handwritten | | | x |
| Flyers | | x | x |
| | | | |

Table 2. An at-a-glance comparison of “high-low-no-tech” solutions

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# APPENDIX D. IMPLEMENTATION PLAN

How could localities go about implementing this three-pronged approach? The plan described here is crafted for one community ("the City") to enable a wide variety of communications tools to be quickly put into place. The plan can easily be replicated in other communities, or scaled up to cover a wider geography.

The "high-low-no-tech" implementation plan is described here; cost estimates for this plan are included in Appendix E.

## 1. Overall Preparations

Overall, emergency managers should embrace a "system of systems" to address a range of disasters. Steps to get there:

- Take inventory of current communications channels to ascertain access to a variety of solutions. These questions may be helpful:
    - Does the City have access to high-tech channels, particularly social media channels and text messaging?
    - Does the City have access to low-tech channels, particularly hyper-local community radio, and amateur radio?
    - Is the City prepared to mobilize no-tech solutions, particularly the ability to print flyers and distribute them?
- Educate senior leadership and staff about the need to be prepared for all scenarios, including total loss of infrastructure.
- Establish and/or augment staff training and exercises to include public communications needs, particularly when the situation is at its most dire.
    - Exercises should include elements that require flexibility; after all, emergency managers will not know exactly which communications channels will be available to them in every scenario.
    - The City can also hold emergency preparedness exercises with the community. For example, hold a community tabletop exercise on a severe, multi-day power outage and invite the public and stakeholders, including the power company.

Once the City has conducted its communications inventory, it can begin to assess next steps for each of the three prongs—high-tech, low-tech, and no-tech.

### 2. High-Tech Plan

**Social media:** City government should adopt policies that embrace the use of social media channels, not only for emergencies, but also for day-to-day needs, to establish them as trusted sources. Local governments in the disaster-affected areas of Japan's GEJE (Great East Japan Earthquake) now consider social networks to be a valuable communications tool in disasters.[227]

- Does the City currently use social media channels, e.g., Facebook, Twitter, YouTube? If not, set them up and begin using them now, because once a crisis strikes, it will be too late to create the accounts and build a following.
    - Perhaps some City agencies already use these channels and can be of assistance. Often, Public Information Officers (PIOs) have communications skills that lend themselves to this task. The Maryland Emergency Management Agency includes social media skills in its routine training for PIOs.[228]
    - The City's Emergency Communications Center (911 center) should make contingency plans to monitor Twitter, in the event of total loss of 911 telephone service.
    - Better yet, the City should consider implementing Next Generation 911, through which people can contact the 911 center by phone, text message, Twitter, video, or Facebook.[229]

227 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

228 Kim Stephens, "Maryland Emergency Management Agency Plans for #SMEM," iDisaster 2.0: Social Media and Emergency Management, http://idisaster.wordpress.com/2013/03/03/maryland-emergency-management-agency-plans-for-smem/.

229 WJZ-TV, "Maryland Offers Residents Option to Contact 911 by Twitter and Text Messages," CBS Baltimore, July 15, 2012, http://baltimore.cbslocal.com/2012/07/15/new-technology-makes-it-easier-to-contact-911/.

- The City should consider setting social media policies for internal staff use of the tools, as well as Terms of Use for users.[230]
- The City can recruit and prepare to leverage a cadre of digital volunteers to help monitor and manage social media accounts during a crisis.
- The City can also consider use of crowdsourcing tools for situational awareness and real-time information inputs from the public.
    - For example, for 2012's Hurricane Sandy, Fairfax County, Virginia launched a crowdsourced map to help collect information on downed trees, flooding, and traffic lights out.[231] This type of map also helps provide residents with useful information on affected areas, damage, flooding, shelters, etc.
    - In 2013, FEMA (Federal Emergency Management Agency) launched "Disaster Reporter,"[232] a crowdsourcing tool to aggregate reports from the public; this could prove very useful for local emergency managers.

While the cost of the social media platforms is generally free, staff time must be devoted to these efforts. As more City agencies join social media, the City should consider purchasing access to software to help it manage all social media accounts across the enterprise. For example, HootSuite and Sendible offer services to enable easier management of multiple accounts.

**Emergency alerting service:** When mobile traffic overwhelms cellular networks, often text messages can still get through. This type of service enables emergency managers to send emergency text messages to mobile devices and email accounts. For example, the localities of the National Capital Region (NCR)

230 Arlington Virginia, "Social Media General Terms of Use," Arlington, Virginia Newsroom, http://news.arlingtonva.us/social-media-general-terms-of-use.

231 Fairfax County, "Fairfax County Reporting Map (Beta)," Fairfax County, Virginia, https://fairfaxcountysandy.crowdmap.com.

232 FEMA's new crowdsourcing tool is free for local emergency managers' use. See http://www.fema.gov/disaster-reporter.

have banded together to coordinate and encourage residents to sign up for free alert service where they live and work.[233]

- Does the City already have an emergency alert service? If so, are relevant staff trained and experienced with using the system?
- If the City does not have such a service, it should seriously consider obtaining and implementing one.[234] A number of contractors offer such services; be sure to choose one that is robust and has sufficient power backup.
- The Federal Communications Commission (FCC), together with the Federal Emergency Management Agency (FEMA) and the wireless phone industry, manages the Wireless Emergency Alerts (WEA) program.[235] This enables emergency managers to send text messages to mobile customers serviced by a particular cell tower, thus not requiring the customers to opt-in. In the National Capital Region, for example, the National Weather Service is using WEA to send urgent alerts of tornado and other dangerous weather conditions. Local governments can also gain access to use the system for localized alerts and should incorporate this useful tool into emergency plans.

**Outdoor warning systems:** The City may also wish to consider installing an outdoor warning system to be able to get out hyper-local information. Modern warning systems enable voice instructions, in addition to a siren sound, as well as silent testing. This type of system may be especially useful in an urban environment.

**Directing digital traffic:** During emergencies, telephone and mobile networks are usually quickly overwhelmed.

- As part of its preparedness efforts, the City can encourage people to use text messaging and email during critical emergencies, as well as limit their phone usage. (The National Capital Region is considering just such an educational campaign.)

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233 National Capital Region, "CAPITALERT: Washington, DC Region Emergency Alert Services," Governments of the National Capital Region, http://www.capitalert.gov.

234 The governments of the National Capital Region use the RoamSecure (RSAN) platform from Cooper Notification.

235 Federal Communications Commission, "Wireless Emergency Alerts (WEA)," U.S. Government, http://www.fcc.gov/guides/wireless-emergency-alerts-wea.

- The City can also assist lobbying efforts to encourage the U.S. federal government to adopt policies to enable prioritization of emergency voice traffic.

**Private efforts:** Governments should also embrace and support private efforts.

- Google, for example, is looking at way to assist elderly persons in future emergencies. One idea is to use evacuation centers as information hubs, providing computers and assistance to those who need the help.[236]

### 3. Low-Tech Plan

The primary focus for low-tech options is radio.

**Hyper-local community radio:** In previous disasters, local radio has proven extremely helpful; in many instances, local radio has been the primary way that residents have received valuable information. Every household should have a wind-up radio.

- Does the City have existing local community radio stations? If so, the City should establish solid working relationships with station management to ensure smooth operations during an emergency.
    - The City should also consider subsidizing these hyper-local stations to ensure they will be there for the next disaster and ready to broadcast, as recommended by the World Bank.[237]
- If there are no such existing radio stations, can the City identify a non-profit group that would be willing to create and manage one?
    - Current Federal Communications Commission (FCC) approval processes do not allow for the rapid stand-up of local radio, so these stations and relationships should be established well ahead of when they are needed.
    - The City can consider purchasing "Radio-in-a-Box" technology, which provides everything needed for radio

236 Appleby, *Connecting the Last Mile: The Role of Communications in the Great East Japan Earthquake*.

237 Shaw et al., Knowledge Note 3-2; Cluster 3: Emergency Response / Emergency Communication.

broadcast in one relatively inexpensive box[238] (see Figure 16).

- Preparations, policies and exercises can be put into place similar to those already in place to partner with local amateur radio—a.k.a. "ham" radio—operators.

Figure 16. Proteus 'Radio in a Box' (from In a Box Innovations 2013)

**Amateur "Ham" radio:** Ham radio has also proven to be extremely valuable during emergencies. Ham radio operators primarily assist with point-to-point communications, and do not broadcast to a mass audience. They are, however, very helpful to responders; across the United States, thousands of Ham operators have earned their permits after passing stringent testing.

- Does the City have existing relationships with local Hams? If so, these relationships should be strengthened and Hams should exercise regularly with City emergency managers.
    - Hams have been extremely valuable in helping with communications between first responders, emergency managers, and critical facilities such as hospitals; these partners should also be involved with the exercises.
    - If relationships do not currently exist, the City should recruit and nurture relationships with local Hams. This can easily be accomplished through the American Radio Relay League, the national association for amateur radio.

238 Rukmin Wijemanne, "In a Box Innovations," In a Box Innovations, http://www.inaboxinnovations.com.au.

### 4. No-Tech Plan

The City also must make preparations for the direst circumstances, which could include total loss of infrastructure. What channels could be available for emergency managers to use to communicate with the public? The "no-tech" option also helps close the "digital divide," by providing information to those who may not have access or use smart phone technology.

**Posted flyers:** If all else fails, the City should be prepared to post flyers with critical information, ideally, at places where people gather. When a massive flood wiped out Grand Forks, North Dakota in 1997, the town stood up a Public Information Center, which used old-fashioned newsletters to communicate with thousands of people living in FEMA (Federal Emergency Management Agency) trailers.[239]

- The City's emergency managers should compile a list of possible venues at which they can post information; this list will serve as a starting point.
    - This list can include City libraries, community centers, fire stations, government center, etc. This should also include places where people will naturally gather, e.g., grocery stories, gas stations, convenience stores, evacuation centers, shelters.
    - Keep in mind that you will have to remain flexible, as it will depend on which venues are actually available and open after the disaster.
    - The City may have existing relationships with volunteer groups who could take on responsibilities for helping to distribute flyers around town.
- Does the City have at least two photocopiers with access to emergency generator power and protection from flooding problems? If not, can you make arrangements with 2-3 nearby towns for backup printing assistance?
    - Similar backup arrangements for use of computers would also be helpful for the writing of flyers.

239 City of Grand Forks, *Grand Forks Flood Disaster and Recovery Lessons Learned*, City of Grand Forks, North Dakota, 2011). http://www.grandforksgov.com/Reports/lessonslearned.pdf.

- Does the City have existing robust relationships with other nearby localities? Such relationships, created and nurtured well before an emergency, could prove invaluable should such “mutual aid” be needed for a no-tech communications scenario.
- The City should also consider stocking plastic folders or protective sleeves, in order to protect posted flyers that must be posted outside.

**Other options:** Can include using a bullhorn or the broadcast systems in public safety vehicles. If the U.S. Postal Service is working (and people have houses and mailboxes), a mailed letter/card is another option. However, some of these involve electricity in some form, e.g., finding a photocopier or printer that has access to electric power.

- Could the City partner with non-profits or volunteer groups to help create an information outreach program? Nurturing these relationships before an emergency would be invaluable.

# APPENDIX E. COST ESTIMATES FOR IMPLEMENTATION PLAN

The "high-low-no-tech" implementation plan is described in Appendix D; cost estimates for this plan are described here. Cost estimates are one-time, unless noted otherwise. Cost estimates vary widely, depending on strategic direction, available resources, and scale. The figures represent best estimates.

| Item | Cost Estimates | Notes |
|---|---|---|
| **Overall preparations** | | |
| Take inventory | $0 | Existing staff should be able to take this on as a project. |
| Educate senior leadership | $0 | Existing staff should be able to help leadership understand the importance of the project. |
| Establish/augment training | $0 - $25,000 | Existing staff can take this on, or the City can hire a contractor. |
| **High-tech plan** | | |
| Establish and manage social media accounts, e.g., Facebook, Twitter, YouTube | $0 - $100,000/year | The tools are free to set up and the City can identify existing staff to manage the accounts. Or, the City can hire a contractor or additional staff. |
| Tool to manage multiple social media accounts | $5,000+ /year | Enables staff to easily manage multiple City accounts. |
| ECC contingency plans to monitor Twitter | $0 - $100,000/year | Existing staff can handle this task. Or, the City can hire a contractor or additional staff. |
| Next Generation 911 | +/- $7 million | In 2012, Montgomery County, MD paid $7 million for its system. |
| Establish social media policies | $0 | Can be handled internally. |
| Crowdsourcing tools | $0 - $100,000/year | Most tools are free to set up and the City can identify existing staff to manage the accounts. Or, the City can hire a contractor or additional staff. |
| Emergency text alert service | +/- $500,000 | One-year cost for National Capital Region (population of 5.8 million) is $735,000 for Cooper Notification's RSAN service. May be eligible for grant funding, or through mutual aid. |

| Item | Cost Estimates | Notes |
|---|---|---|
| Outdoor warning system | +/- $1 million | In 2007, Dallas purchased a system for $3.3 million that consists of 153 sirens that cover 95% of the city. May be eligible for grant funding. |
| Directing digital traffic | $0 - $50,000 | City can use normal communications channels, and can engage in an advertising campaign. Lobbying efforts can be handled regionally, or through national associations. |
| **Low-tech plan** | | |
| Subsidize community radio | $12,000 - $120,000/year | Depends on station's financial stability and City's willingness to subsidize. |
| Radio-in-a-box | +/- $10,000 | Online quote for product from In a Box Innovations is $12,500. |
| Recruit and nurture Ham radio operators | $0 - $12,000/year | Conduct regular drills and exercises. |
| **No-tech plan** | | |
| Compile list of venues | $0 | Can be accomplished by existing staff. |
| Photocopiers with emergency backup power | $0 - $25,000+ | Some equipment or infrastructure purchases may be desired. |
| Partner with non-profit groups | $0 - $10,000+ | City may wish to consider some small grants to ensure participation when needed. |
| Relationships with other localities | $0 | Relationships can be started and nurtured with existing resources. |
| Plastic folders | $100 - $1,000 | Depends on quantities needed for number of target venues. |

Table 3. Cost estimates to implement the high-low-no-tech plan

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